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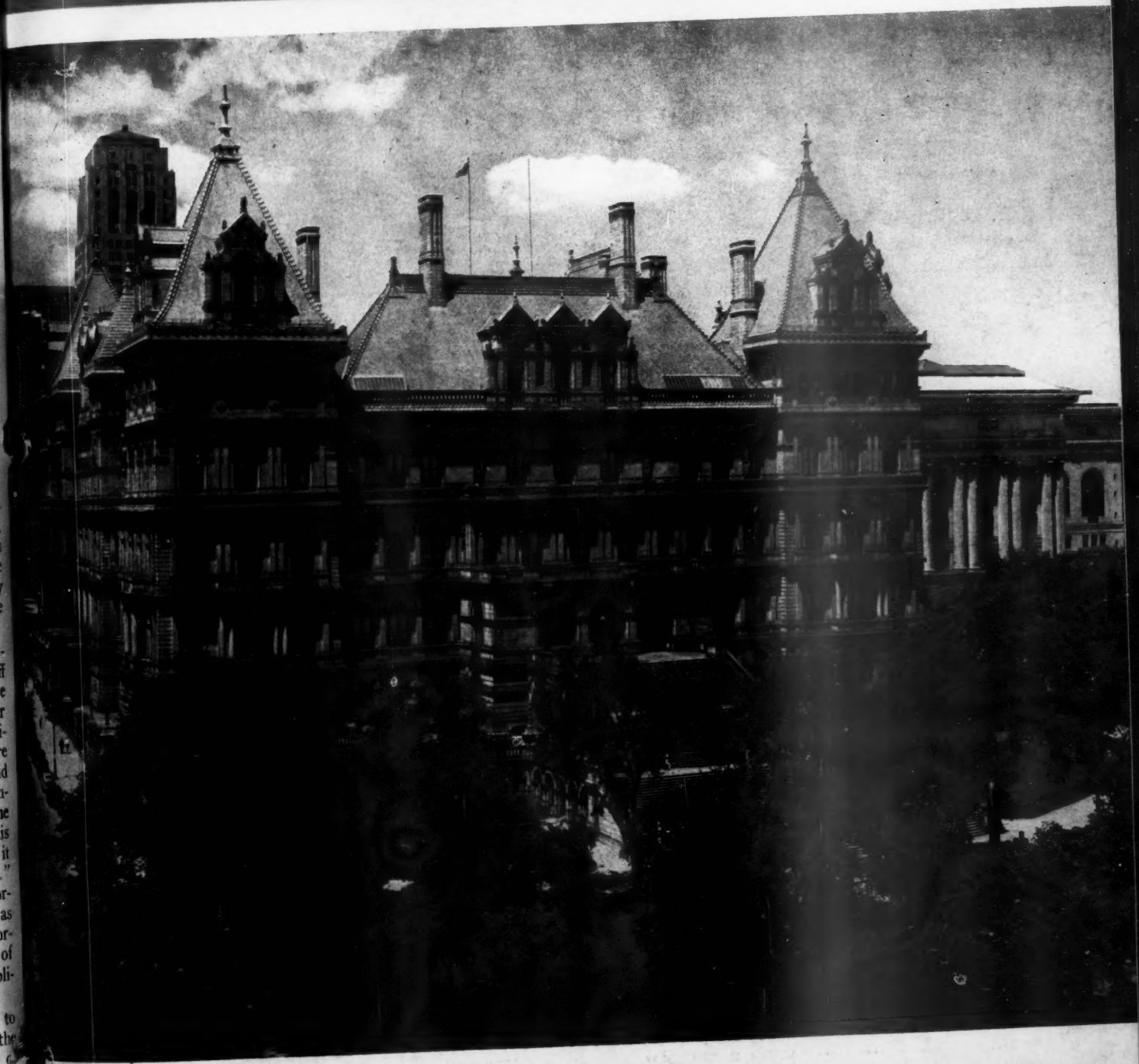

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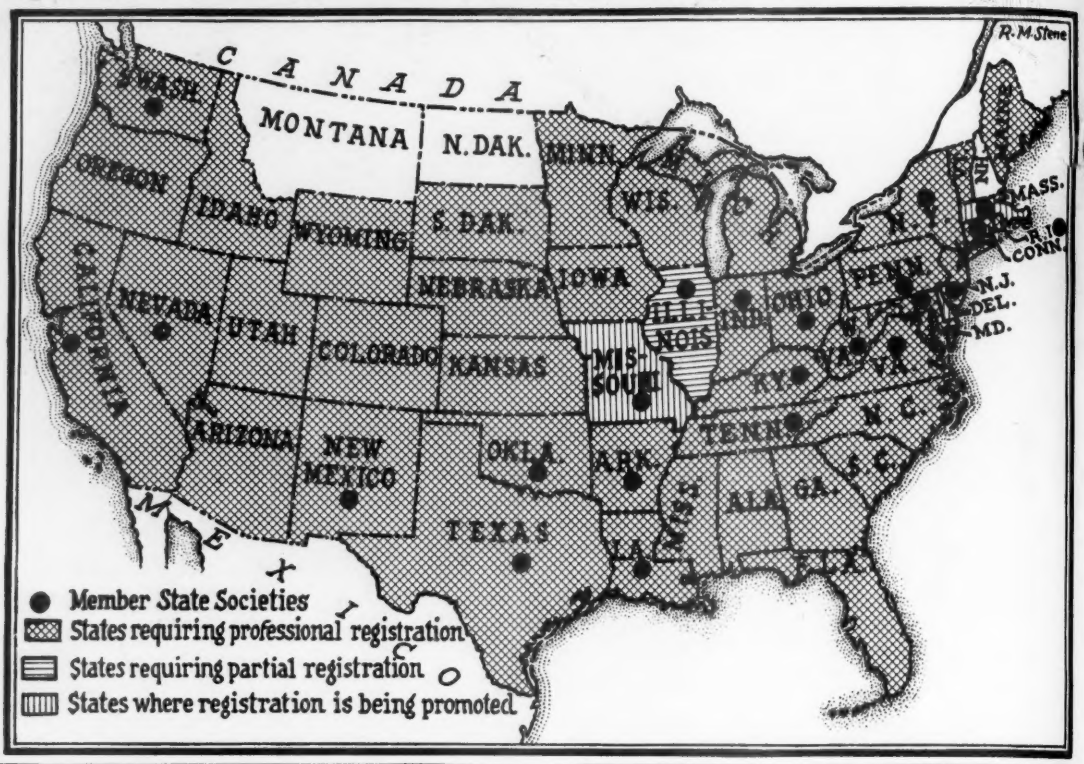

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Editorial Staff

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Editor-in-Chief

ARTHUR V. SHERIDAN
Associate Editor

EDWARD LARSON
Business Manager

Editorial and Advertising Offices
222 North Third Street
Harrisburg, Pennsylvania

EXECUTIVE OFFICE
National Press Bldg., Washington, D. C.

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THE COVER

Photo by Robert Gross,
New York State Bureau of Publicity

The New York State Society of Professional Engineers, Inc. is one of the largest and most influential member chapters of the National Society of Professional Engineers. It should certainly have a preferred position in our display of state capitols.

So, on our cover this month we give you the New York State Capitol at Albany, showing the 32 story state office building in the rear, and the end of the State Education Building at the right corner of the Capitol Building.

The American Engineer assumes no responsibility for statements or opinions expressed by contributors. Their names identify the source of the same.

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EDITORIAL • • •

N. S. P. E. and the State Boards

The National Society of Professional Engineers now comprises twenty three state societies. The National Council of State Boards of Engineering Examiners, which is to hold its twenty first annual convention in Charleston, South Carolina, October 28th to October 31st, 1940, now comprises forty three member boards.

There are direct and constant relationships between the chief functions of the National Council and the National Society; namely, those of protecting the public by qualifying competent engineers only, and by protecting the profession in the same manner.

Except for the fact that some members of State Boards are also members of our National Society, and that in the past there has been correspondence of mutual interest between officers of the two groups, there is not a close official relationship between them. Recently, we feel, there is a growing better understanding of each other's problems.

In some states, the Boards have asked member State Societies of N. S. P. E. to offer suggestions on checking the qualifications of applicants; reporting illegal practices; and helping legislatures understand the general registration problem. There is a broad field in which member State Societies can be helpful to the Boards and to the profession without being forward or intrusive.

To further this mutual understanding, we urge members of the National Society to attend the National Council's convention and listen to its proceedings.

THE REGISTRATION BULLETIN, published quarterly by the National Council of State Boards of Engineering Examiners (T. Keith Legare, Executive Secretary; National Headquarters, 503 Carolina Life Building, Columbia, S. C.) contains the following:

> "Visitors Invited. Everyone interested in the activities of the National Council, or in the legal registration of engineers, will receive a cordial welcome at all business sessions and entertainment features of the Convention."

Elsewhere in this issue of THE AMERICAN ENGINEER, we reprint a digest of report by the committee on qualifications for registration to be presented at the annual convention.

The purpose of this editorial is to direct the attention of our members to the fact that there are other organized groups with which we can cooperate, and through which we may function.

The recent editorial in *Engineering News Record,* also reprinted elsewhere in this issue, directs attention to the need of an agency in Washington which may keep in touch with the national legislation, and aid the profession in its contacts with the many governmental bureaus; and the possibility of a field for us there, as we have been performing such functions for some time in the past.

It is evident there are yet wider fields in which we may help the profession!

ROBT. HALL CRAIG
Editor

Engineers Responsibility Toward the Engineering Profession

Address by Engineer Robert C. Wheeler at a recent meeting of the Albany County Chapter, New York State Society of Professional Engineers

I think it may be assumed that each member of a profession in return for the distinction conferred upon him through membership in such a profession, is in duty bound to so conduct himself that he will not bring it into disrepute or even loss of dignity, and I believe that it may be further expected that he will make some contribution toward the advancement of the profession.

With this assumption as a start, we may well look to its practical application to the profession of which we have the honor to be members. In doing this I am assuming the point of view of the Engineer in private practice.

Let us first look into the present status of the Engineering profession; second into certain important differences between it and the professions of medicine and the law which enjoy a position in society which might well be at least our first objective, and then in the light of these factors consider what our practical responsibilities comprise.

The new Century dictionary has this to say of a profession, "the word implies previous attainments in special knowledge as distinguished from mere skill; the practical dealing with affairs, as distinguished from mere studies or investigations; and an application of such knowledge to uses for others as a vocation as distinguished from the pursuit for ones own purposes."

The latest issue of *Civil Engineering,* The Journal of the American Society of Civil Engineers, has an article on professional status—Canadian Viewpoint. To quote briefly from this article, "the early Engineer of this country was a species of scientific or skilled tramp with a precarious tenure of position who furnished his employer with the skill of his trade without questioning public policy or the best solution."

That it still was considered a profession was indicated by an Engineer who stated, "That his parents had left him some money to study a profession and on his choosing Engineering certain persons tried to prevent him from getting the money representing that Engineering was not a profession at all. He had to prove the validity of his choice in the courts at great expense and was impressed with the great surprise exhibited when the court decided in his favor.

The above is probably a fair statement and while Engineering has in a vague sort of way been considered as a profession, it has not developed a tradition, and to quote again from *Civil Engineering,* "There is still a very long way to go before the measure of public appreciation now readily accorded to the other professions will be granted to Engineering as a matter of course."

One group of Engineers who have gone a considerable way in outlining a code of professional ethics to guide the conduct of its members in their relations with each other, with their clients and with the public, have set forth a number of standards of action, the violation of which is to be considered "unprofessional and inconsistant with honorable and dignified bearing." These in a general way include the following:

That he shall not act for his clients in professional matters otherwise than a strictly fiduciary manner.

That he shall not accept any trade commissions, discounts, allowances or indirect profit.

That he shall not neglect to inform his clients of any personal connection, interest or circumstances which may be deemed as influencing his judgment or the quality of his services to his client.

That he shall not receive directly or indirectly any royalties gratuities of commission or any patented article of process unless the same is expressly authorized in writing.

He shall not offer commissions or otherwise improperly solicit professional work.

He shall not attempt to injure falsely or maliciously directly or indirectly the professional reputation, pursuits or business of a fellow Engineer.

He shall not accept employment by a client while claims of a fellow Engineer previously employed by the same client and whose employment has been terminated remains unsatisfied unless they are in the process of adjudication.

He shall not attempt to supplant a fellow Engineer after definite steps have been taken towards his employment.

He shall not compete with a fellow Engineer by reducing his usual charges and attempting to under bid after being informed of charges being made by his competitor.

He shall not review the work of a fellow Engineer without the knowledge or consent of such Engineer unless the Engineer's connection with the work has been terminated.

He shall not publicly advertise his professional business in self-laudatory language or with conspicuous display.

He shall not submit proposals for or enter into contracts for the construction of works, plans and specifications for which have been prepared by him in capacity of professional Engineer for a client, and finally

He shall not be associated in the conduct of profesional work with others who do not conform with the standards of this code.

While these are perfectly definite rules laid down for the governing of members of a specific association, still we may feel that most Engineers who are engaged in private practice and who wish to maintain a high standard of professional conduct will not deviate very far from them.

In general, however, in view of the fact that profession is new in the sense of not being seasoned in its present mould and that it has not developed any considerable tradition, the responsibilities of the Engineers toward each other are not well defined. Actually it is a matter of each Engineer determining for himself just what obligations and responsibilities he is willing to assume. In the case of the independent practitioner this is far from academic. However, to quote again from *Civil Engineering,* "on the other hand, the development of strong cooperative professional spirit has undoubtedly been retarded by the

fact that many members of the Institution (The Engineering Institution of Canada) are employees of large corporations or governments and work under conditions that frequently make it difficult to take a firm ground in asserting the prerogatives commonly associated with the profession." It is not difficult to imagine that in a great many instances of Engineers who are employed by large industries and by governmental bodies, questions involving professional responsibility arise infrequently if at all.

So far as the responsibilities of the Engineer to his profession are concerned it would seem to me that first and foremost comes the responsibility of acting in an honorable and dignified manner so that his conduct at all times be a credit to the profession. If he does this he will do more to raise the standard of the profession in the eyes of the general public than by any other single method. While it is unfortunate that the name Engineer is also applied to mechanics who have a non-professional status, still in view of their long entrenched use of the term, it would seem to me more important to develop a high standard of conduct among professional Engineers than to wrangle with the Brotherhoods over the use of the term. If we do attain to professional stature I do believe that a distinctive appellation will follow in due time.

Second: The Engineer as a professional man owes it to his profession to conform to a code of ethics containing rules of conduct similar in substance to those quoted, in order that there may be a friendly feeling or at least a minimum of friction between himself and his brother practitioners and that the dignity of the profession may be upheld. It seems to me that those are minimum requirements when it comes to the matter of what he should do.

Third: Looking toward the advancement of his profession there are a number of things with relation to which I feel that his responsibility extends to a degree depending at least partially on his individual situation.

a. He should do what he can to aid and encourage the younger Engineers and help to develop in them a spirit of responsibility toward their profession.

b. He should do what he can toward furthering legislation to the benefit both of the public in protecting it from fraud or being imposed upon and improving the condition of the Engineer by developing a security without which the best professional work is impossible. He should also be willing to devote some time and energy to the advancement of the body of professional knowledge. And

Fourth. There is the matter of the relation of the profession to the public, with regard to which I cannot see at present how there can be developed a condition analogous to that of the doctor or lawyer.

These two professions plus the clergy, which I have not mentioned before because it seems quite in another sphere from ours, have dedicated themselves to the public weal in a peculiar and special way, that is to say, that if a person is too poor and unable to pay for professional services these are furnished him free. In the case of the Doctor this may be done through a free clinic, in the case of the Lawyer he may be assigned to a case by the judge and in most cases the fees for performing similar service will be varied depending upon the ability of the client to pay.

The Engineer is not situated to give service in this way. So far as I can see, the nearest thing to this that he can do would be to dedicate some of his time to sitting on commissions or being a member of other public bodies where his special and professional knowledge will have a value beyond his merely devoting his time as a public spirited layman. However, it is not to be expected that these opportunities will be at once thrust upon him, because the Engineer has usually been rather a retiring sort of person. However, as the public becomes acquainted with his motives, of the high character of his actions, these opportunities will come, and with this service he will appear less as a detached individual and more of the professional man devoted to the service of his fellow beings.

From a Column of *The Austin* (Texas) *Statesman*

TOM MARTIN SAYS

The Sage of Sage Hills

In this day and age when people spend most of their time cussing the Guvment, it is a relief to run into a department that is run like McGraw's hit and run ball team. I think a majority of the people really appreciate a public servant when he is delivering the goods. I have always heard that an engineer is the most successful of all professional men. You've heard the old argument that doctors bury their mistakes and lawyers send theirs to the penitentiary. Well, it is my humble judgment that engineers don't make mistakes, especially as an organization. As proof of my statement I want to refer you to Texas State Board of Registration for Professional Engineers. Their Board is composed of Carl L. Svenson of Lubbock, A. F. Mitchell of Corsicana, Ed. C. Connor, Chairman, of Dallas, George R. Brown, Vice Chairman of Houston, and J. S. Hudnall of Tyler. But to seal the old fruit jar they have Fred Rightor as Secretary, a man who was a success in private life and is a genuine administrative official.

I don't have the space to print their code of ethics, but they just about cover everything except poor spelling and bad writing. This department tolerates no hokum. When a man has a license from this Board it's just like a gold bond, they don't take any chances. They prescribe a rigid requirement of their applicants and in addition thereto they must present the Board with satisfactory evidence that they are "Four Square;" when in doubt they are called in for a written examination.

When the Board was created the engineers started to run as soon as the barrier was sprung. They got off to a flyin' start and they've kept the lead, a good slogan for some departments would be "Get Right Rightor."

The boys in A. J.'s Johnson City Barber Shop were commenting upon a certain man always being right. A. J. said: "He was so right his wife admitted she was wrong."

CONTRIBUTIONS WANTED!

— NEWS —

FROM EVERY MEMBER STATE SOCIETY OF N. S. P. E.

The National Council, Its Purpose and Function, Deserve Wider and Deeper Appreciation and Support

By VIRGIL M. PALMER, Rochester, N. Y.

Chairman, Committee on Registration, American Society of Mechanical Engineers; Chairman, New York State Board of Examiners of Professional Engineers and Land Surveyors; Vice-President, National Council of State Boards of Engineering Examiners

It is a little realized but true fact, that the significance of current action is rarely appreciated during its occurrence. Full understanding and appraisal, too often, comes only after the die is cast, when guidance and control are no longer timely and possible, and when the resultants of the actions must be accepted and conformed to. Well known examples of the foregoing are the results which followed the labor saving inventions at the beginning of the Nineteenth Century, the so called, Industrial Revolution, and the current world-wide social revolution which is now following the extreme integration of business and industry and its attendant belittling of the individual and neglect of human values. If there had been general and wide-spread recognition of the social forces at work and their impending resultants; then, studied, deliberate and purposeful control could have been exerted; the actions would have been more moderate; and then, the reactions would have been far less violent.

The general registration movement is a current action, the significance of which is entirely too little appreciated. That part which requires the registration of Professional Engineers will have a marked influence upon the Profession. It is consequently of direct interest to all engineers, regardless of branch or type of employment.

The registration of engineers has become the law of the land through the action of the engineers themselves for the benefit, first of Society generally, and secondly, of the engineering group of Society; not through restriction, as is sometimes mistakenly assumed, but through assuring increasingly better and better service to Society and a more general and greater recognition and appreciation of this service. If registration is to be effective, the action already taken must be backed up with the active interest and support of the great body of engineers in every community. There must be appreciation of the distinction and ability which registration demarks, and a constant, active and jealous zeal to keep this distinction and demarcation unsullied by any unethical, unprofessional or incompetent practice.

Because of Federal Constitutional restrictions and the guaranteeing of states' rights, there is not now, and as far as can be anticipated, there cannot be in the future, any Federal registration of engineers. Such regulation is reserved and restricted to the various states, territories, and the District of Columbia. The boundaries of these political subdivisions of our Country are entirely accidental. They were determined by the facilities of earlier times and the sequence of controlling events. There is no reason, for example, why of the six New England States, four states should have different registration laws and two states should have no registration law as yet, nor why an area almost four times as large, Texas, should have a fifth registration law; but there is every reason why Professional Engineering competence should be measured and appraised by the same yardstick everywhere, and why the minimum requirements for registration should be uniform in every state. Safety and stability of structures and machines and sound engineering practice know no limits of parallels of latitude nor longitude and no limits of state boundaries. The requirements for safety of life, health and property do not differ. They are universal.

The many inconsistencies and variations in State Statutory Law occurred from many causes and these inconsistencies become increasingly obnoxious with increase of interstate business. Some causes of differences have been jealousy over states' rights, difficulty of breaking established customs and lack of any coordinating agency and coordinating effort looking toward uniformity. For differences in Engineering Registration Law application and requirements, no such justifying causes exist.

Now, while registration is yet in its formative period, is the time to exert active, considered and constructive effort, to the end that registration laws and their administration be a positive benefit, first to Society as a whole, and second, to our profession. The National Council of State Boards of Engineering Examiners is organized for this explicit purpose, and since 1920, has been giving an increasingly important advisory service to its Board members and to national and local engineering societies in their efforts to bring about uniformity in statutory requirements for registration and in all other provisions of registration laws, their application and administration.

While in early days there were but two kinds of engineers, military and civil, now seventeen different accredited courses for training engineers are offered and there are over seventy well defined branches of practice with new ones being frequently added. Individual lifetime practice is rarely limited to one single branch of engineering and it is exceedingly difficult or impossible to define where one branch of practice begins and another leaves off. All, however, grow from the same common trunk and all are now and will be increasingly in the future, affected by the registration requirement.

Already, the registration requirement has barred incompetent men from further practice. It has generated a greater appreciation of scientific knowledge. It has stimulated extended study by practical engineers with limited technical training. It has caused critical analysis and improvement of faculty, facilities and technical course content. It has engendered an increased professional consciousness and self-respect within the profession and an increased appreciation of Professional Engineering services already rendered and possible of future beneficial use by those without the profession. National Council has had a profound influence on all of this. For these functions, which benefit the entire profession, National Council deserves the active, wholehearted support of all the different national, state and local engineering societies and of the whole great body of individual engineers who yet need more light in order to see and appreciate what the current action of required registration for Professional Engineers portends.

(Reprint From *The Registration Bulletin*)

The Power Situation in Indiana

By PROF. C. C. KNIPMEYER

Head of Electrical Dept. Rose Polytechnic Institute, Terre Haute, Indiana

The title for this paper is neither specific nor definite. It does not specify what kind of power nor does it indicate what sort of a situation is to be considered. Yet in this present day one naturally thinks of electric power and the engineer naturally thinks of its application to social and industrial needs.

There would be little or no need to discuss this subject if in this world and in this nation and in this state, progress had ended and the present routine of living stayed unchanged. But all people, and the engineers better than any others, have visions of greater industrial activity, of new processes, of new business, of new inventions and of new power applications, all ranking greater and greater as well as different demands on power resources. They want to know the power situation in connection with this vision of new and better things.

Commercial electricity has had its birth and growth entirely during the life time of many of us here today. Fifty years ago it hardly had a start. By 1902 there was a total of about one million K.V.A. in generator capacity. In three years this was doubled. It doubled again in four years, again in six years, and still again in five years, so that by 1920 the total capacity was sixteen million K.V.A. By 1928 this again was doubled. By 1937, in spite of depression years, it had grown to 37 million, and now we find that domestic consumption has grown to such a volume that with resumption of normal industrial activity an extra 4 million K.V.A. capacity is needed above the 1937 figures. Is there reason to fear a power shortage?

For Indiana a power map presents an interesting picture. In the extreme north and northwest generating capacities total more than 300,000 K.V.A. In the central north and west about 100,000 K.V.A. are available. Indianapolis, in the center of the state, can supply 180,000 K.V.A. Terre Haute, in the west, has a total of 90,000 K.V.A. capacity now. Fifty miles below Terre Haute, one plant has 32,500 K.V.A. And in the southwest corner of the state 65,000 K.V.A. are available. These figures total about 800,000 K.V.A. Actually the state has about 1,100,000 K.V.A. in generating capacity or about 3 per cent of the total for the United States. About 4 per cent of the energy produced in the state is by water power.

The above distribution is interesting, but not of great importance. About 40 years ago, when power systems were small and isolated, Steinmetz, with outstanding wisdom and foresight, predicted that the day would come when the whole United States would be checker-boarded with interconnecting transmission lines capable of receiving power from any plant and delivering it anywhere. The prediction of Steinmetz has become a reality to a more thorough and impressive extent than he perhaps realized, so that now plant sites are chosen without slavish regard to centers of consumption.

Ideal plant locations are those having an abundance of water for condensing purposes and cheap coal. Lake and river sites over extensive beds of good coal, easily mined, are best. The Wabash River is ideally situated over the coal, the Ohio and White Rivers have coal near and the Indiana shore line of Lake Michigan can get coal at a price not prohibitive. On the Wabash River the foundations are now going in for an additional 50,000 K.V.A. at the Dresser plant from which two existing 132,000 volt lines can feed to all parts of the state. In our capital city of Indianapolis, centrally located, 35,000 K.V.A. will be added to the Harding Street plant next year. In this case careful study showed that this addition was to be preferred to building an entirely new plant on the Wabash with a new line to supply the Indianapolis system.

Indiana has made gratifying progress in the development of a network of dual 132,000 volt power lines over the state. Up to the present time the greatest accomplishment has been made in the north and east portions of the state. Shortly there will be hardly any section of the state unable to get abundant power supply from several different sources and directions by means of loops and interconnections.

Throughout the nation this network of power wires is becoming so complete as to wipe out state boundaries in-so-far as power problems are concerned. Load dispatching is so agreeably and skillfully carried out that a consumer generally has no knowledge of or interest in his actual source of supply. Consider an almost inconceivable emergency, where Indiana, say, could not be supplied from within its own state, so calls on sources in Ohio. Then, having no reserve to spare, Ohio would call on Pennsylvania or West Virginia. With these states also short, they could call the Carolinas. If here some power could be spared for West Virginia, this state could spare some for Ohio and then Ohio could supply Indiana. Thus it is seen that distances, in effect, shrink and lose importance. Close cooperation in interchange of power, also, allows steady loading of the more efficient plants with the less efficient held for stand-by service.

It is worthy of note that plant efficiencies are steadily improving. For the entire nation 3.00 pounds of coal were used per K.W.H. in 1920. By 1930 this figure was reduced to 1.62 pounds and by 1937 it was reduced to 1.43. It is still undergoing reduction. It is to be observed that these improvements are passed on to the consumers through state public service commissions whose duty it is to make equitable rate adjustments. For few other commodities can the public be so sure of having to pay only a fair price.

In other ways, also, there has been improvement. The load factor, based on the ratio of energy output to plant capacity, has steadily increased except during the early years of the depression. This improvement has come both in industrial and domestic loads. In the past twenty-five years the average residence load has become two and one-half times greater but the cost has become greater by only one-half. By consumer education and financial inducement, power factors have improved, this through synchronous motor and capacitor application as well as by more intelligently fitting motor sizes to the loads they carry. By education, too, copper sizes in circuits are generally more nearly adequate and breakdown, fire and life hazards reduced.

(Continued on page 27)

An Engineer Looks at World War II

CHARLES STURTZEN*

Rectifier Division—Allis-Chalmers Manufacturing Company

Scuttled ships . . . smashing air raids . . . economic blockades . . . you've read about them every day. But here's the inside story of what's happening to European engineering and manufacturing companies behind the Siegfried and Maginot Lines

* Charles Sturtzen is an American engineer, who was employed in Switzerland for nearly two years immediately preceding the present conflict. The views expressed herein are opinions of Mr. Sturtzen and are not to be construed as representing the editorial policy of Allis-Chalmers *Electrical Review*.

For nearly two years prior to World War II, I had the experience of working in a European engineering office. The plant was located in the industrial center of Switzerland and thus about in the heart of Europe. Since Switzerland is a neutral country that still enjoys a democratic government in the fullest sense of the word, freedom of speech and press are taken for granted, and news from the outside world enters uncensored.

Switzerland, with its small area (less than half that of the State of Wisconsin) and its limited natural resources, has to import practically all raw materials that are needed in industrial processes. Consequently export is imperative in order to maintain economic equilibrium. This economic interdependence makes neutrality of vital importance. The people have realized that and have made it the fixed policy of the government to refrain from taking sides in the disputes that keep many other European states perpetually embroiled.

Neutrality

The individual European, however, is anything but indifferent to world politics. He hears and reads political news, forms his opinions or accepts those of others. Politically the Europeans are much more ardent than the people of this country. While baseball or football games occupy the minds of Americans a great deal and provide topics for conversation, the Europeans have never learned to enjoy these pastimes. Perhaps if they could learn to be less solemn and onesided, the number of European wars would be cut down. As it is, their predominant theme of conservation is politics. Even if they settle down to a peaceful game of cards, they usually wind up with some heated political argument.

The Swiss are especially likely to do that. In spite of their government's rigid neutrality, the individual takes sides and has very strong political convictions ranging outside the boundaries of his own country. But in the life of industry, political views recede far into the background. I may say, this holds for all European countries and to a great extent even those in which the government exerts its controlling influence over speech and even thought.

In our plant worked people of almost every nationality. Their private views on politics were often antagonistic, but this did not affect their cooperative relation in office or shop. Much more startling was this behavior when business representatives from foreign nations—Germany, France, England, or some other—would visit to sell their goods. While the cleavage between the democratic governments and those of the totalitarian states became steadily greater, the men of industry would still meet each other on a common ground. It might be taken for granted that they would exercise mere tactfulness as business people. But more than that, these men found pleasure in their mutual acquaintanceship and displayed genuine friendliness.

Reactions of Propaganda

Those people of a neighboring country, the far-reaching control of whose government even directed the policy of engineering publications, felt not always at ease when political advertisement and propaganda became too apparent in their technical magazines, which were often used during our discussions. I recall one incident when the works of Heinrich Hertz were mentioned.

Hertz was a great physicist. Setting out to prove experimentally the electro-dynamic field theory of Maxwell, he was the first to succeed in doing so. It was he who discovered the existence of high frequency waves and demonstrated the relation between light and electricity. The term "Hertzian waves" has become a common technical expression. His nation was proud of him. His countrymen placed his bust in the hall of fame of the great industrial museum in Munich. Since that day politics has removed his bust from its niche, and his country's leading engineering magazine has now discovered that, though he died at the age of thirty-seven, toward the end of his life he had lost some of his former keenness of intellect. His work on the principles of mechanics was criticized, and its weak points attributed to the man's part-Jewish ancestry.

In such cases any thinking engineer would frankly admit that this sort of propaganda is not acceptable in the professional world. Perhaps it lies in the nature of engineers to be more conservative than some other groups and not to be easily swept away by the dictates of new political systems. From the human relationships of the profession which I saw in Europe one could never have predicted the looming catastrophe of war. It seemed always a great paradox to me how these people of different countries could meet as individuals to be friendly participators in a business deal, while in a political body they would try to exterminate each other.

Material Problems

As the tension between the nations grew, the difficulties in our work increased. As always, the selection of proper materials from which the engineer builds his machines required careful study. Some materials improve; others are gradually changed by manufacturers and become often less applicable. Entirely new building products appear on the market. Their nature varies, and likewise their cost. Prices and qualities must be almost continuously checked and compared. This is one of the designing engineer's duties whether he works in America or Europe. But while the United States in its own

country possesses a vastly greater variety of raw materials than any other nation, the selection in the European countries is narrowed down considerably. In addition to this limitation come the trade barriers as a result of import duties and quotas.

Business with France on the whole was very agreeable if one had patience to wait for delivery. France seems to be a nation that does not like to go along at 20th century speed. In my line of work, where flawless steel and high grade porcelain were required, we got better quality guarantees from Germany. But in doing business with German firms other difficulties arose. Their armament and war preparations were reflected more and more in the difficulty of obtaining materials that might be needed at home for these purposes. Germany was no longer interested in exporting steel for manufacture. The price quotations on steel, as we used it for anode plates of rectifiers, were so high that it could not be bought. Our own steel mills in Switzerland would often offer the same items at half the price of German quotations although the ore had first been imported from some other country. However, steel plate nine feet in width was too big for the Swiss steel mills and had to be imported.

Czechoslovakia proved to be a favorable supplier. But no sooner were business negotiations with Czechoslovakian firms well under way than Germany took over that country, and its businesses became coordinated with the rest of Germany and subject to the same restrictions. We had already had the same experience with Austrian firms. Much more severe for us than the changes in sources of supply were of course the lost markets, because the countries which fell into the German Reich were obliged to give business preference to the latter.

The Germans were, however, always very eager to sell products that required a great deal of their services. Service was what they wanted to sell rather than materials. In the case of porcelain insulators, for example—whose ingredients, such as kaolin, quartz, and feldspar, Germany has in abundance—the price quotations were low. But not steel.

In America we do not realize what a tremendous advantage results from the enormous variety and easy accessibility of raw and semi-finished materials. These things are taken for granted here and account for some of the wastefulness that is going on all the time. How different from American construction the technical designs in European engineering are can be understood when one realizes that while the ratio of labor cost to that of material is, for example, 25 percent for one particular machine in Switzerland, it is about 7 percent for the same machine made in America. In addition to the world problem of unemployment, the difficulties in obtaining materials were heightened by the lack of cooperation among the various governments.

Mobilization

And then came the war. With one big stroke was smashed what had been so laboriously worked out through months and even years. The whole machinery for useful production slowed down. Deliveries were delayed, and many of them stopped entirely. Those manufacturers with enough foresight had tried to fill their storerooms. I dare say few could do it since their economy did not permit hoarding. Business faced the most difficult problems. Although many orders were cancelled, work increased suddenly. New sources of supply had to be found. Many a design underwent a transformation.

And yet this was not the hardest blow. The governments, whether at war or neutral, called their men into the army. It was a sad day for Switzerland as well as for other countries when the best of its male population exchanged their working clothes for uniforms. Day after day, endless trains of soldiers moved into their new posts. Schools were closed, and many of them changed into barracks or emergency hospitals. Nobody knew how soon these would be filled with victims of war. Public buildings, such as auditoriums, congress halls, and railroad waiting rooms, were spread with straw and converted into army quarters. A few days after mobilization the streets looked deserted except for women, old men, and children. Many stores were closed; others almost without male help. Women took over the work in post-offices, butcher shops, milk routes.

And in the factories and offices the staffs had shrunk to below 50 percent. Even men who had been in key positions were now somewhere at the border stringing up barbed wire. The few left at their civilian jobs had to carry on alone as well as they could. One can hardly visualize what a tremendous task of reorganizing went on during the weeks following the general mobilization.

Life did not stand still. It adjusted itself to the new conditions. Sad to say, many a milling machine and lathe is no longer used in service to mankind but for the production of machine guns and projectiles. History had previously seen plowshares melted into guns. We can only hope that this war will not last long enough to cripple the nations involved with its slaughter. Whatever the outcome, the scientists and technicians will again set to work, as they have before, to repair the destruction and to carry on the interrupted task of helping to build our civilization.

(Reprint from *Allis-Chalmers Electrical Review* of March, 1940.)

New York State Board of Examiners

During the fiscal year ended June 30, 1940, the N. Y. State Board of Examiners of Professional Engineers held 12 meetings and considered a total of 1247 applications. Of this total, 153 were rejected, 585 were held for written examinations, 112 were held for further consideration, 250 were licensed after passing the written examinations, and 147 were approved for license on the basis of long established standing and experience. The total number of applications considered during the year was about 40% below the total of the preceding year.

This report includes the results of the June 1939 and February 1940 examinations. At the June 1939 examinations, 237 candidates appeared and of these 132 passed, 73 were conditioned in one subject, and 32 failed. At the February 1940 examinations, 235 candidates appeared and of these 118 passed, 77 were conditioned in one subject and 40 failed.

The 1940 Legislature enacted one amendment to the licensing law. Under its provisions, persons showing ten or more years of engineering practice prior to 1927 and who subsequent to 1927 were employed by the State or any political subdivision are given the opportunity of having their cases now considered on the basis of the requirements in effect in 1927 instead of being compelled to meet the present requirements. This amendment remains in force only until December 31, 1940. Some 25 candidates have already applied for licenses under the provisions of this amendment, and these applications are now being considered.

The present personnel of the Board is as follows:

Norman R. Gibson, Chairman
David B. Steinman, Vice-chairman
Roy G. Finch, Secretary
Erich Hausmann
Virgil M. Palmer

Some Phases of the Current Transportation Problem

By ENGINEER A. C. CLARKE

Assistant Chief Engineer of the Baltimore & Ohio Railroad Company at Pittsburgh

There was at first in my mind some doubt about the propriety of presenting to an organization of professional engineers a paper on a subject so obviously non-technical in character. Like all railroad men today, whether we are in the operating, traffic, engineering or some other part of the game, our specialized interest is completely overshadowed by the difficulties which beset the industry as a whole and we are all prone to concentrate our thinking on the general situation—because, after all, our specialties cannot mean very much if the industry fails to survive. I thought perhaps I might be considering this presentation from a rather selfish point of view until it occurred to me that engineers deal with problems vitally concerned in national economics and that engineering projects cannot get very far without adequate transportation. I decided then, that any small amount of light which I might be able to throw on the subject of our current transportation problem should be of definite interest to engineers irrespective of their devotion to the purely technical side of their profession. Because so many facts are involved and because so much can be said on the subject, it has been necessary to make a rather careful selection of material suitable to a presentation of reasonable length and the proper organization of the data has led to a paper in written form for which I ask your indulgence.

Not so long ago, in reporting to the President of the United States on a plan for the use and control of water in the thirty-one States comprising the Mississippi Drainage Basin, a Committee of nationally known scientists and technicians said: "The maintenance of an effective comprehensive transportation system is possibly the most fundamental, immediate problem that we have to face. A nation with our territorial extent, population, culture and vital dependence of one section upon another, is unique. It has been made possible only by an elaborate and adequately supported railroad system. Therefore, any move however desirable it may be in itself, which unduly infringes upon the serviceability of railroads, is to be deprecated." In another report to the President and Congress, Mr. Joseph B. Eastman, a member of the Interstate Commerce Commission and formerly Federal Coordinator of Transportation, said: "we have followed a policy of encouraging an oversupply of transportation" and "unregulated competition may be quite as much of a public evil as unregulated monopoly."

Now the authors of these statements had in mind a national transportation system which today comprises railroads, waterways, highways, electric lines, airways and pipe lines—a complex interlocking system with a maze of problems, individual and collective. For our purposes here it will be in order to discuss certain of these transportation modes briefly and thereafter eliminate them from the picture as not important to the main issue.

Transportation agencies include roughly about 140 Class 1 railroads. These are railroads each having a gross revenue of more than $1,000,000 per year. In addition, there are about 500 short line railroads of varying degrees of importance. There are some 62,000 truck lines operating on the highways and about 4700 bus companies. In addition the national transportation system comprises about 111 electric railways, 19 air lines, 52 pipe lines, one express agency and 450 common, contract and private waterway operators.

Electric railways were built and operated in this country primarily for the transportation of passengers. They were never a serious factor as far as freight traffic is concerned. In recent years the number of electric railways has been dwindling rapidly and the past ten years has seen the number of operating companies cut almost in half. They may be dismissed from further consideration as a factor on the current transportation problem.

Airways provide our latest and most rapid mode of transportation but here again we find passenger service predominating, with mail and express business as a solid background. When we take into account that the airways and the electric railways handled only about one-tenth of one percent of the national freight business during 1937, I think airways can also be dismissed as an important factor in the present transportation situation.

Pipe lines are confined to one commodity group and are obviously the most limited in scope of any of our transportation agencies. Unquestionably they perform a service in our transportation system at a lesser cost than can be furnished by any other agency and are, therefore, economically justified beyond the shadow of a doubt. Approximately 8% of the freight tonnage of the country was handled by the pipe lines in 1937 and rightly so. But the limitations of this "specialty" in the transportation field are such that it is not a factor which merits further mention in this discussion.

I think, by pausing here for a moment to say something about passenger traffic as a whole, we can perhaps eliminate any further mention of the 4700 bus lines which form a part of our national transportation system and can thereby still further simplify the problem we are attempting to consider. In the past 20 years, the number of passengers carried by the railroads in this country has decreased by more than one-half and, of course, this has resulted in a substantial loss to railroad income. But this is something we just have to face and the situation is, in my opinion, a closed issue and one which has at most only a minor bearing on the current transportation problem.

Most of the 4700 bus lines provide what is essentially local service and in this respect they replace the old electric railways rather than the steam railroads. As for the long-haul passengers, they have their choice of travel by the interstate bus lines, the airways, the railroads, or their own automobiles. The loss which the railroads have

suffered in the past 20 years with respect to passenger transportation is chargeable in only a limited degree to the advent of the busses and the airways. The real loss comes from the use of private automobiles which, according to actual registrations, have increased in the past 20 years from about 3,000,000 cars to over 25,000,000 cars or more than eight times.

The fact of the matter is that, with the possible exception of airways, all forms of commercial service devoted to passenger carrying business reported fewer passenger miles in 1937 than in 1926 despite the fact that the nation had a considerable growth in population during this period. There is only one answer—the private automobile—and since no one can gainsay the right of the individual to select his own mode of travel and since in this country it is quite evident that people prefer to use their own cars to a marked extent, it can be concluded definitely that the railroads will not regain the position which they once held in passenger traffic. As opposed to other modes of long-haul transportation, the railroads will unquestionably hold their own by increased use of high-speed, stream-lined trains, and by air-conditioning and other modern conveniences, but in the last analysis a considerable part of their passenger-carrying business is gone and might as well be forgotten. We can reasonably eliminate the passenger department of our transportation system as a serious factor in the current problem.

I rather like the concept of one commentator who classifies the airways and the busses and the electric lines and the pipe lines as the "veins" of our transportation system, and calls the railroads and the trucks and the waterways the "arteries" because they do the heavier work so essential to our national existence. And it seems to be the arteries which today are out of balance and lack that coordination so essential to the life blood of the national body. Herein, beyond a doubt, lies a major cause of the illnesses of our transportation system.

In recent years it has been a popular pastime to diagnose the ills of the railroads and prescribe for their cure. Few national issues have received more attention from statesmen, industrialists, bankers and economists, to say nothing of railroad executives themselves. The best minds devoted to the problem seem to agree that the railroads are sound, virile, progressive public servants giving the American people the best and cheapest transportation in the world, but that they lack sufficient railroad traffic to produce an adequate revenue and are involved in uneconomical competition.

As far as the lack of freight traffic is concerned, this is of course attributable to the years of depression and the low tide of business throughout the country. There is little the railroads can do about this except to hope that the tide has turned. But with respect to uneconomical competition there is much that can be done and it is on this phase of the problem that I would like to lay some facts before you.

It would be interesting perhaps to go back to the old argument about whether the highways or the waterways first served mankind in the dawn of civilization but this would be a good deal like the old riddle about the hen and the egg and would not be particularly pertinent. It does seem necessary, however, to give some kind of a background against which our current transportation problem can be clearly "spotlighted" and perhaps it will be worth while to say a few words about the development of transportation in our own country.

If we confine ourselves to the history of this continent since the advent of the white man, I think it can be safely said that our natural waterways were the first transportation arteries. With early settlements established along our coast lines and our rivers, use was made of the Indian trails to reach the interior and gradually paths and roads were developed for pedestrian and highway traffic to form a crude highway system. These elemental means of communication served our needs reasonably well for the limited quantity of traffic which had to be transported up to perhaps the time of the Revolution, At the beginning of the 19th Century, however, it was perfectly obvious that something would have to be done to supplement nature in this matter of transportation. Our commerce was centered on the Atlantic Seaboard—as was our Government, our culture and our wealth. But our citizens, in ever increasing numbers, had been moving steadily westward across the mountain ranges to the fertile midwest plains. Here their settlements were growing in size and importance demanding a sure means of communication—a method of transport at once direct, speedy and able to carry heavy tonnage. We have then the development of the National Road and similar trunkline turnpikes—built partly with private capital and partly at Government expense and operated quite generally by a system of tolls. These were a distinct improvement but still failed to cope with the growing demand for bulk transportation. It was evident that a one-ton or a two-ton load unit could not possibly provide required capacity. The answer seemed to be man-made waterways and we have then the Canal Era extending roughly from 1817 to 1837.

The canals, developed in the eastern part of the United States and the midwest section east of the Mississippi River during the first half of the 19th Century, undoubtedly provided our country with its first semblance of a national transportation system. The Erie Canal was the first national project of this kind to be completed and is still in a class by itself in that it is the only part of the original canal system still surviving although now identified as the New York State Barge Canal. Perhaps a statement of one result of the Erie canal when it was completed in 1825 will serve to show just what the canal era meant to the development of transportation in this country. Where before it had cost $100 to move one ton of freight from New York to Buffalo in 20 days, the Erie Canal upon completion, permitted the same ton of freight to be moved between the same points in eight days at a cost of only $10.00—a truly remarkable benefit to a growing nation.

Now, with the Canal Era nicely under way, we find a new device entering the transportation field. Railroads—operated with horses or cables but, nevertheless, railroads—had long since been found practical for mine and quarry work in the East but, more to the point, this innovation had proven its merit in England, where several hundred miles of line were actually transporting passengers and freight in successful and profitable service. Certain of this traffic, in fact, was being hauled by mechanical monsters known as steam engines.

This new means of transportation had its first active appeal to the merchants of Baltimore. Dissatisfied with the projected Chesapeake and Ohio Canal because this project, following the Potomac River, must logically meet navigable water at Washington City—not Baltimore—these merchants were casting about for some other means to insure for themselves a continuous share in the valuable and growing mid-west trade. A railroad seemed to provide the answer and, after careful study and investigation, the Baltimore and Ohio Railroad was incorporated in 1827 and construction was started the following year with Wheeling and the Ohio River as its goal.

Other communities caught the fever. By 1832, more than one hundred and thirty miles of railroad had been completed on incorporated projects totaling nearly six hundred miles and an additional thousand miles were planned in scattered units from New England to the Carolinas and even west of the Allegheny Mountain barriers. The railroad locomotive had become a dependable reality and railroad transportation was "on its way."

While it has been said that the Canal Era covered the years from 1817 to 1837, it should be understood that construction of many of the canal projects, initiated during this period, carried on through the forties and in the fifties. But by 1837, rail transport had definitely shown itself so much superior to canal operation in the matters of speed, economy and flexibility that the promotion of additional canal mileage ceased. When railroad construction caught up with the midwest canal routes some years later, operation of canals ceased to be a factor in our further national development. It can be pointed out that the canal projects were, for the most part, privately owned and controlled. Many had been constructed by State and local government but most of them sooner or later found their way into private hands to be operated strictly on a profit and loss basis. So it was that they could not withstand the competition offered by the superior advantages of railroads and, about 1870, passed quietly from the picture. Our natural rivers and the Great Lakes again took up the burden of our inland waterway transportation.

The tremendous growth of this Country during the latter part of the nineteenth century brought with it a peak in railroad construction. Heavy immigration, a continuous westward movement, almost unbelievable development in the production of raw materials and the utilization of these materials in the new industrial age—these were factors demanding transportation, and plenty of it. Railroads were the order of the day. They could be built anywhere—and frequently were. Almost any kind of a railroad found favor with the public and its speculative dollars. Naturally, mistakes were made—errors of judgment as to locations and financing, poor economics, sometimes penny-pinching construction, but perhaps worst of all, an overdevelopment in certain sections where the race was to the swift in an effort to control the tonnage producing centers. The result was cut-throat competition, rebating, manipulation, and almost disaster. It was evident that the rail industry was badly in need of a doctor.

In 1887, the Doctor was provided when Congress created the Interstate Commerce Commission, empowering this new Federal agency to diagnose the railroad case, prescribe for the patient, and see that the medicine was taken. Since then the railroads have been on an increasingly strict regime and the doctor has really become a resident physician.

It will not be necessary here to review the details of that control which the Interstate Commerce Commission has now exercised over the railroads for nearly half a century. Suffice it to say that no plan for railroad financing, no change in railroad rates, no phase of railroad operation can become a reality without the careful scrutiny and final approval of the Commission. Perhaps I might emphasize a detail of this control which frequently escapes the casual observer. I refer to that power by which no interstate railroad, nor any part thereof, may be extended or abandoned without the approval of the Commission. Let us see what this has meant.

It has already been stated that unregulated enthusiasm for railroad building during the latter part of the 19th Century resulted in an overdevelopment of railroad facilities, particularly in the heavier producing centers. Regulation put a stop to this. The Interstate Commerce Commission includes in its personnel a staff of trained economists, technicians and investigators. For the past fiftv vears, no railroad or railroad extension has been built in our country for interstate business until the project had first passed the scrutiny of these experts in the matter of its necessity and expediency and its desirable effect upon the public as a whole. Still more to the point is the need for similar approval by the Commission and its experts before any part of an interstate railroad can be abandoned. This requirement has, in a way, worked a hardship on the railroads particularly in cases where sound economics demanded the abandonment but where the approval of the Commission could not be given without seriously affecting small and otherwise isolated communities. Progress in the abandonment of much of the unsound railroad construction inherited from the boom days has, of necessity, been slow but this very slowness has induced a condition whereby the stronger lines have established a sort of a protectorate over the weaker roads, bringing about our large trunk line systems as we know them today.

In describing the regulatory power of the Interstate Commerce Commission, it will be noted that no mention has been made of railroad labor. A picture of the railroad situation would not be complete without referring to the Adamson bill of 1916, a law which, definitely and once and for all, unionized all railroad labor, which has since worked exclusively under contracts between railroad management and the twenty-one railroad brotherhoods and unions governing wages and working conditions of every description. Nor can we pass up reference to the National Railroad Labor Board established a number of years ago to pass upon conditions and controversies respecting rules and working conditions and which in its actual operation has turned out to be a device giving Government an astonishing amount of control over this phase of industrial organization.

We have then in this country today a complete network of railroads comprising something over 238,000 miles and providing what is admittedly the best and cheapest transportation in the world. It represents an investment of about 26 billions of dollars of which only some 18 millions of dollars are capitalized. Although it is regulated by Government in every phase of its activity and cannot buy, sell, build or abandon without Government approval, it is nevertheless privately owned and pays taxes which, in 1937, amounted to more than 325 millions of dollars. If we can keep some of these facts in mind for just a moment, we might turn back to the waterways and the highways and bring them up to date.

We left the waterways at the close of the Canal Era. These years of canal activity had definitely committed our Government to a policy of improving rivers and harbors under Federal direction and with Federal funds. As early as 1824, the first Federal appropriation had been made for river improvement. Naturally the main rivers were the first to benefit by governmental attention but the canals brought tributary streams into the picture—streams only partly navigable by nature but necessary for the operation of canal routes. The eventual abandonment of the canals left these improved tributaries in the hands of the Government to be maintained—in many instances regardless of economic justification. By 1882, Federal responsibility for rivers and harbors required an appropriation of well over 100 millions of dollars—and this was only a beginning.

It would seem opportune at this time to point out that there is not, and never has been, any real regulatory body over our National waterway system. The War Department and Army engineers have charge of our waterways and are responsible for all construction, maintenance and operation. In fairness, it must be conceded that they do an excellent job. But they do not pretend to have trained economists and technical advisors in the transportation field and, in the last analysis, they are limited in their activities to exactly what Congress dictates. It is here that politics unfortunately enters the picture. However much we may deplore the term "pork barrel" legislation, we know it has existed. Its basis is the desire of our duly elected delegates at Washington to demonstrate to "The folks back home" that they are really on the job. Waterway improvements in our country have for generations been a favorite item for the "pork barrels" and a favorite means of barter and exchange between our legislators. It is interesting to note that an exhaustive investigation by a Federal Commission appointed in 1908 found only 287 rivers in our country which could possibly be classified as navigable. Yet in 1928, Congressional appropriation provided for work on 292 rivers and there were more than 400 so-called navigable streams included in the Army Engineers' report for 1933.

It is impossible to say what the capital investment in waterways may be in our country. Such expenditures include flood control, irrigation, power development, etc., but a careful analysis indicates that these necessary things account for only about one-fourth or one-third of the total money appropriated and that the rest is fairly chargeable to waterway transportation. Perhaps some vague idea of our stake in waterways can be gathered if it is repeated that the Federal appropriations for Rivers and Harbors amounted to $111,000,000 in 1882, and if this figure is then compared with the Federal appropriation of $666,000,000 for 1910 and something over one billion dollars for 1920. Maybe the picture can be enhanced if it is stated that the total charge on our Federal books in 1932 was just a shade under two billion dollars and that since then something like an additional three billion dollars has been alloted for construction and maintenance of navigable waterways.

Time will not permit any detailed discussion of the whys and wherefores of such vast expenditures by our Government for waterways, particularly in the last 20 years. Some of the improvements have been definitely worth while from the standpoint of national transportation—perhaps none more so than the work which has been done to improve navigation on the Monongahela, Ohio and lower Mississippi. As against these worth-while projects, we might mention the canalization of the Missouri River, estimated originally to cost three and one-half million dollars, subsequently estimated at twenty million dollars and reported adversely by the U. S. Engineers, and finally built because of political pressure at a cost exceeding fifty million dollars—to provide freight transportation which, according to one analyst, cost the taxpayers of the country nearly $8,000 per ton during the first year of operation. What is more to the point in this discussion is an analysis of our inland waterways to see what results they produce as compared with our railroad system. There are perhaps two outstanding examples.

In 1917, the Federal Government commandeered for war purposes all boats and barges on the lower Mississippi and Warrior River Systems. When the Armistice was signed, it did not seem like a good idea to scrap this inland fleet and it was, therefore, turned over to the Secretary of War to operate as a government facility. The loss averaged one million dollars per year for the next five years and this was too much for even a beneficent Congress. In 1924, the Inland Waterway Corporation was established to see that the operation was conducted along strictly business lines. A governmental interpretation of strict business in such a case does not include interest on the investment, nor taxes, nor office rent, and the executive officer is loaned without charge to the Corporation. Perquisites include free legal service, free postage and a wireless franking privilege. It would seem that a business ought to succeed under these conditions but the official record of the Inland Waterways Corporation for the eight years ending September 1932, shows a total net income of only $125,000 per year on an investment of 24 millions of dollars of the taxpayers money. And the investment covers only equipment, terminal facilities, etc., and does not include what was spent on these rivers to make and keep them navigable.

Mention has already been made of the New York State Barge Canal, successor to the old Erie Canal and the only active survivor of the old Canal Era. This is the longest artificial waterway in the world and the only real demonstration that we have in our country as to the effectiveness of artificial waterway transportation, From first to last, the State of New York has spent $346,000,000 on the New York State Barge Canal. The project as we know it today was started in 1903 and opened to traffic in 1918. Seven years later, an unusually frank State official reported candidly to the Governor of New York that the operation of the barge line had cost the State and its taxpayers $4.51 for each ton of freight floated on the canal that year regardless of length of haul. He added that it would have been much cheaper to put all of the business on railroad cars and let the State pay the regular freight charges.

It is interesting to note from the records that the cost of the New York State Barge Canal was some $370,000 per mile while the average cost for all of the eastern railroads has only been about $188,000 per mile. It might well be that a per mile cost basis is a ready indicator of the economic value of any transportation unit in our country today. The records show that it has only cost the Federal Government about $129,000 per mile to improve the Monongahela River which is one of the few streams showing reasonable cost to the taxpayers according to an analysis of the Mississippi Valley Committee. The Federal expenditure for improvement and maintenance of the Ohio River does not exceed $150,000 per mile and this is another of the natural streams offering minimum subsidy to transportation. How different the picture on certain projects now pressed so urgently on the Government. We do not have to go far from home for one illustration. We hear a great deal these days about the proposed Lake Erie-Ohio River Ship Canal which, according to the latest Government estimates, would cost the taxpayers approximately $2,720,000 per mile.

So much for the railroads and the inland waterways and canals. While these transportation agencies were developing, what of the highways?

Following the failure of the highways to provide necessary bulk transportation in the early part of the nineteenth century and the submergence of this form of mass transportation in favor of the canals and subsequently the railroads, our highway system developed along entirely natural lines as a means of local communication between people and for the local hauling of supplies and materials to and from the main transportation agencies.

For the most part, the location, development and maintenance of the highways were in the hands of the municipalities, townships and counties with some more or less casual interest on the part of the States. It was not until the advent of the automobile that State governments began to assume a definitely proprietary interest in highways and it was some several additional years before the Federal Government definitely displayed its interest in the matter. Our highway system as we know it today is definitely a development of the last 30 years and its value as a national transportation agency can really be limited to the last 20 years. I do not think this statement can be seriously disputed when the records show that the number of trucks using our highways jumped from 215,000 in 1916 to 4,255,000 in 1937 or an increase of almost exactly twenty times.

The development of our present-day highway system in this country has been so recent and so much a part of our every-day lives that it will not be necessary here to recite the factors in its growth. What we are concerned about in this discussion is an analysis of the highway system with respect to national transportation—and in this regard, we are fortunate in having available a very complete analysis published by three eminent highway engineers as late as January 1939. Clifford Older, as head of the Illinois State Highway Department, conducted the famous Bates Road tests which developed the fundamental basis of today's highway construction; Professor Charles B. Breed is head of the School of Civil Engineering of the Massachusetts Institute of Technology; and Professor W. S. Downs, former engineer of the West Virginia Highway Commission, is now Professor of Highway Engineering in the University of West Virginia. This group of highway engineers are recognized as outstanding in their profession and are the authors of the recent analysis.

In their study, they first undertook to determine the total annual cost of roads and streets in this country. They undertook further to determine what part of these annual costs is borne by the general taxpayer and what part by the motor vehicles using the highway and what should be the equitable division of cost between these two different groups. They concluded by calculating how the cost properly chargeable to motor transport should be divided as among the different classes of vehicles. Their results are decidedly illuminating.

Although the periods specifically reviewed in this report cover the years from 1921 to 1932 inclusive, the analysis is based on an economic study of our highways in this country for as many years as there are any records available and specific and detailed data dates from 1893 although such data is not available in complete form for any one year until about 1920. The period of review is terminated at the end of 1932 for much the same reasons. State and Federal spending programs since 1932 have disrupted statistics to a considerable extent although the records are reasonably complete for 1937 and definitely verify the conclusions reached in the study of the 12 year period mentioned.

In the twelve years from 1921 to 1932 inclusive, this country spent nearly 21 billions of dollars on its street and highway system. Of this tremendous sum, approximately 5 billions of dollars was used on State Highways, nearly 9 billions of dollars on county and local roads and slightly over 7 billions of dollars on city streets. After taking into account the public utility character of highways and streets as recognized more or less definitely long before the motor vehicle appeared, the analysts proceed to an application of the principles of utility finance and accounting and thereby reach the studied conclusion that approximately 5 billions of dollars in the total expenditure is properly a charge against the general tax-paying public. They find that the remaining 16 billions of dollars, or better than 75% of the total expenditure, is properly chargeable to motor vehicle owners. They are able to state from definite records that, during the 12 year period, motor vehicle owners paid to the Government in license fees, gasoline taxes, etc., the sum of approximately 6 billions of dollars or about 10 billions less than the highway costs properly chargeable to them. In brief, this 10 billions of dollars represents a subsidy to highway transportation over the 12 year period from 1921 to 1932 inclusive.

The report proceeds then to a further study of this subsidy by a detailed analysis of types of road, pavement and structures, the relationship existing between wheel loads and highways costs, the effect of impact, the necessity for additional widths of pavement and the responsibilities therefor, the resultant increased maintenance costs, etc. It is determined that, for example in the year 1932, typical motor vehicles failed to pay their portion of highway and street costs—or in other words were during that year subsidized by the tax-paying public—in the amount of $15.27 for each passenger car and ranging from $108.00 for a 1½ ton truck to $1920.00 for a commercial truck of over 5-ton capacity. A corresponding analysis for the year 1937 shows that the subsidy was then no less than it had been in 1932.

Now if I have made myself clear, we are not here at this time considering electric railways, airways, buses and pipe lines nor anything which has to do with passenger service or mail or express or which might be classed as a "specialty" in our transportation system. We are confining our attention to railroads, highways and waterways which are the "arteries" of the system and annually transport some 92% of the tonnage so vital to our national existence. We have painted a background for our set and have assembled most of the properties. It remains then, simply to set the stage.

In the center (and the middle certainly seems to be where they properly belong) suppose we spot the railroads—a transportation agency comprising 238,000 miles serving every nook and corner of the country, an industry owning its own right of way and all of its facilities with a total investment of some 26 billions of dollars, an industry regulated by Government in every phase of its activity to the point where it has lost the flexibility so necessary to a competitive world, an industry privately owned and paying taxes amounting to more than 325 millions of dollars per year, a transportation agency which just a few short years ago carried nearly 90% of the nation's tonnage and now carries less than 65%.

On the right, we might place the waterways—a transportation agency not susceptible to economic analysis because the investment is unknown, an agency with an exceedingly expensive right of way furnished free of cost by paternalistic Government, an agency maintained by Government for users who pay no tolls, a means of transport which contributes nothing to the taxes of the country and in fact subsists on tax money provided by others, a transportation agency which for these obvious reasons has been increasing its traffic annually to a point where in 1937 it handled 21% of the nation's tonnage.

The other side of the stage remains for highway traffic and the trucks. Here again we have a right of way furnished by Government—by the taxpayers. It is true that this is not entirely without charge but we have seen from an expert analysis that payments by the owners of motor vehicles are entirely inadequate to finance their proper share of highway costs and that actually the trucks are being subsidized by the taxpayer to an extent varying

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RECIPROCITY

To Facilitate Interstate Registration and Practice

By D. B. STEINMAN

The problem under consideration is *to minimize the barriers and obstacles to the interstate practice of qualified professional men.* There are two aspects of this problem: A. *Temporary practice;* B. *Extended practice.*

A. *Temporary Practice.* For qualified professional men, as attested by registration in one or more states, it should not be necessary to go to the delay, trouble and expense of securing registration in every additional state in which they may have a brief temporary engagement or consultation; nor should it be necessary for such men to secure registration in forty or more states before they may publish their professional cards in publications of national circulation, or before they may correspond with prospective clients in such other states; nor should an engineering engagement, frequently urgent, involving such qualified professional men, be held up pending action by the Board on a filed application. Accordingly, it is recommended that:

1. All state registration laws should permit practice for at least 30 days, preferably 60 days, in any calendar year by professional men duly registered in another state.
2. All state registration laws should permit continued practice, pending consideration of a filed application, by a professional man duly registered in another state.
3. All state registration laws should permit offering to practice by professional men duly registered in another state.

The foregoing principles covering limited privileges of temporary practice by qualified professional men constitute the first elements of interstate recognition and courtesy intended to be covered under the caption "Reciprocity."

B. *Extended Practice.* When a qualified professional man, as attested by registration in one or more states, wishes to practice for a period of more than 30 or 60 days in another state, it is necessary for him to secure registration in that state. In a spirit of interstate recognition, consideration, and courtesy,—all herein called "Reciprocity" for brevity,—everything reasonably practicable should be done to minimize the inconvenience, embarrassment, difficulty, delay and expense of securing such additional registration. (In other professions, such registration of qualified professional men already licensed in other states, is legally termed "Registration by Endorsement.") Toward facilitating such interstate registration, or "registration by endorsement," the following recommendations are submitted:

1. For registration by endorsement, based on certification of prior investigation and qualification by the National Bureau of Engineering Registration or on certification of prior investigation, qualification and registration by other State Boards, differentiated and simplified application forms should preferably be provided, and the necessity of duplicating the filing of credentials and references should be eliminated.
2. For registration by endorsement, based on National Bureau or State Board certification of prior investigation, qualification and registration, the required registration fee should preferably be reduced.
3. For registration by endorsement, based on such official certification of prior investigation, qualification and registration, every possible consideration, confidence and courtesy should be extended to the applicant, and the embarrassment and delay of reverifying education, experience, and references should be minimized or eliminated.
4. For registration by endorsement, as above specified, the expense and inconvenience of the requirement of personal appearance for oral interview should preferably be eliminated.
5. For registration by endorsement, as above specified, the necessity of taking written examinations should preferably be eliminated. (Written examinations should never be required in the case of professional men of long established and recognized standing in the profession. In the case of younger men, evidence of having passed the written examinations given by another State Board or by the National Bureau should be accepted as the reasonable equivalent and in lieu of any written examinations legally required.)

Adoption and application of the foregoing recommendations by the individual State Boards will constitute, so far as now practicable, a solution of the problem of "reciprocity." Such extension of confidence and courtesy to officially qualified and certified registrants of other states should not be conditioned upon reciprocal agreements or interstate treaties as a prerequisite. (Such bilateral agreements are not generally practicable.)

If the registration laws in any states lack enabling provisions to permit the extension of the courtesies and considerations hereinabove outlined for limited privileges of temporary practice by officially qualified professional men and for "registration by endorsement" for more extended practice by such officially qualified professional men, the necessary permissive legislative amendments should be recommended for enactment.

Engineering Societies Employment Service

IN ORDER to satisfy certain legal requirements of the several states in which it operates, the employment service of the Four Founder Engineering Societies has been incorporated in New York State and its name changed to Engineering Societies Personnel Service, Inc. Over a period of 17 years, the Service through its offices in New York, Chicago, and San Francisco has placed more than 20,000 engineers in private industry and, from 1930 to 1939, more than 10,000 on W. P. A. and other governmental projects.

At the first meeting of the corporation, held in the Engineering Societies Building in New York, Monday, June 10, plans were made to extend the operations of the Service to a greater degree. George T. Seabury, national secretary of the A. S. C. E., was elected president; C. E. Davies, secretary of the A. S. M. E., vice-president; Otis E. Hovey, director of the Engineering Foundation, treasurer; and A. H. Meyer, secretary.

It was announced that the present staff of the Service will continue in their present positions with the corporation. Members of the staff include Walter V. Brown, manager, New York office; Thomas Wilson, manager, Chicago office; and Newton D. Cook, manager, San Francisco office.

A. S. M. E. News Service

Abstract of Report on Professional Ethics Parleys Held in Engineering School

By R. S. SWINTON

Associate Professor of Engineering Mechanics, University of Michigan

At the suggestion of President Ruthven, there has been started among the students of the Engineering College a series of Parleys led by the more experienced faculty members. First there was a public lecture by Daniel W. Meade, Past President of the American Society of Civil Engineers and a dinner attended by almost a hundred students. The subject of the lecture and the Parleys has been those problems of wisdom in professional practice and ethics which confront every graduate soon after he leaves college.

The Engineering Committee on Professional Practice consists of a faculty chairman and four hosts who function until spring vacation. At that time four more are added and trained to continue as members for the next year. It is intended that the hosts shall be popular, earnest, gentlemanly fellows, one being a member of the Michigan Technic staff. About an hour after each meeting gets together, a luncheon of coffee, cheese and crackers is provided to break down any formality and inhibitions.

The faculty member is approached by the student host and, upon his acceptance, receives a letter explaining the idea and several pages of "cases" previously presented. These invariably suggest personal experiences most readily vitalized by the speaker and are conducive to a better preparation of material.

Our Engineering schools have grown great through the efforts of teachers who themselves were professional men. These men now see in the more intense fields of specialization the need of highly trained teachers whose rather compartmented interest and experience has precluded much contact with their fellows. These men do not, however, represent the average or planned product of the school and contribute little in facilitating the student's future adjustments.

The response of the faculty is most cordial and it is believed that those selected have sensed a real service in this work.

It has been suggested that some of the youngest staff members be asked to accompany their chiefs or the guest speakers to these meetings for the benefit of their own perspective.

The student and faculty reaction has been most satisfactory. It is a new experience for many of the faculty and those selected have appreciated the opportunity. Like other ideas, it will take time to overcome inertia and prejudices of many in both groups. The more hard-boiled a speaker is, the better he can put over this kind of a Sunday School lesson, but he must be sincere and like the boys.

It is believed that outside engineers can be interested and should contribute much to selected groups. A careful selection of these guest speakers will give the students the benefit of their ideals and afford valuable future contacts. It is a compliment to the speakers and should lead to a more cordial feeling and interest in the University.

Professional Ethics

Case I

After you have been out of college for two years, during which time you have obtained some high-grade experience in detailing and designing structural steel, you transfer to a small, poorly organized fabricating concern. You find that the concern has a contract to fabricate the steel work for a large church building. You likewise find that one member of the firm agreed with the architect to have a structural design made at the fabricating plant without the knowledge of the client, this in view of the fact that the architect had no competent structural engineer in his organization. The design was made by a poorly trained young man who made it very heavy so as to feel sure that it was safe. The member of the firm then went over the design and increased the thickness of all angles by one-eighth of an inch and stepped up the weight of all other structural shapes accordingly. The architect's plans were made and issued on this basis, and this was the basis on which all other contractors made their estimates.

When this concern made up its bid it subtracted one-sixteenth of an inch from the thickness of the material as shown on the plans. It was therefore impossible for any other fabricating concern to present a comparable bid, since none other knew about the excessive thickness of the material.

The time had now arrived when it was necessary to begin fabrication. Some apprehension was felt by the management about the competence of the original designer, so you are called upon to check the design. You find that it is so excessively heavy that you recommend a considerable reduction in the amount of material to be used. This is done, and the saving from the two increments of weight, the first one made up of the remaining sixteenth inch thickness of metal, and the second one the saving which you are able to make due to your superior ability as a designer, will now appear as unfair profits for the fabricating concern.

Obviously this constitutes collusion between the architect and the fabricating concern to obtain from the client money for services and material which are not rendered.

You have a full knowledge of all that is taking place.

What are you going to do?

R. H. Sherlock

Case II

What appeal has a young engineer to his national engineering society in the case of dishonest practice on the part of a firm he has worked for or in relation to conduct unethical firm to firm? He may file a sworn statement for safe-keeping.

Case III

I am paid by an owner but get my jobs through the salesmen of rather poor equipment which I make function. Whom do I represent? What should I do if no other job is probable?

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Chemical Engineering and Patents

By RALPH H. McKEE

Professor of Chemical Engineering Columbia University

Presented before the New York County Chapter of Professional Engineers

In the United States the rate of issuance of patents has been ascending but the rate of increase of patents issued in the chemical field has for years far exceeded the rate of increase in the general field of patents. In other words, industry is increasingly chemically minded. Indeed, chemistry of late years has been rightly called, using a term borrowed from the army, the Intelligence Department of Industry.

Without patents there is little incentive to invent for remuneration is still more speculative than with patents available. With patent protection one can invest money and time working out details and improvements most of which are not patentable. It is like building a house on land whose title is securely yours. Without patenting it is as if one built on land whose ownership was unknown. With compulsory licensing, such as some European countries have, it is like building your house on land purchased from a set of heirs but only part of these heirs have signed the deed.

With a requirement to work the patent within a given period, say two years, it is like building your house with all your money and in addition considerable borrowed money and having the lender insist on payment at the due date of two years. Maybe you can sell the house at a profit but probably the purchaser, knowing your predicament, will offer you but little more than the amount of your borrowed money, and you will take a loss.

What has a man to sell if he has a patent which can be licensed under a compulsory license? He has only part of a patent to sell or license, for another license may be forced under the patent.

If one considers the chemical field of industry one finds that there are certain industries in which Europe has dominated. I refer to such developments as Bessemer steel, the nickel industry, the manufacture of sulfuric acid by the contact process, high pressure synthetic ammonia processes. These are processes in which the original patents were taken out by Europeans and the momentum acquired by the industries operating under these patents carried them through a number of decades of industrial history.

In this country in the chemical field we have had a number of industries develop and we have become the leading country of the world in these industries. In practically every case these industries had as their start the work of some man whose work eventuated into a patent. Our large rubber industry owes its basis to Goodyear's patent No. 1085 on vulcanization. The plastics industry in which this country is so prominent owes its origin to the Baekeland patents, the first of which issued in 1907. The products from chemical treatment of corn are based on the Behr patent of 1878, No. 250,333. The glass industry has as its basic patent the Owens patent 766,768 of which the 89th claim is the broadest. Electro-chemistry, electrical precipitation, photographic products have achieved their importance in America because of early patents. The petroleum industry dates its chemical development in this country from the cracking process of Burton. The paper industry has as its basis primarily the patent of B. C. Tilghman of Philadelphia a patent that issued in 1867 for making sulfite pulp.

When you visit the World's Fair you are going to see much of the developments of rubber, glass, plastics, and the like so it is not advisable for me to discuss tonight these subjects. I am going to choose as a typical chemical development the manufacture of paper pulp by the sulfite process. This is the most important chemical division of the large paper field.

In general with a chemical invention the history first starts with the idea, a series of laboratory experiments, then an application for patent which later issues as a patent. Then a pilot plant which, if successful technically, is followed by a small industrial plant. Then several small industrial plants, later still a few large plants, and we have the beginnings therein of a large chemical industry.

Tilghman's 1867 patent covered the essentials of the present method of sulfite paper pulp manufacture. His process used a lead lined iron digester and required from 7 to 14 hours heating of the wood chips with the acid sulfite cooking liquor. The digester he used was a stationary one and not a rotating one. The process though successful technically was not successful commercially because the lead lining of the digesters expanded on heating at a different rate from the steel which supported it. Moreover, on cooling it did not return to its original size. His process was subject to the handicap which many other processes have had to meet, i. e., the lack of knowledge of proper equipment in which to carry out the process.

Mitscherlich about 1877 patended his process, a modification of Tilghman's, and it was brought to this country about the same year. He used a brick lining instead of a lead lining for the steel digester. The heating was done with lead coils carrying steam and later copper coils carrying steam. The steam used was at a low pressure of 30 to 35 pounds because that was all the lead pipe would stand. The time required was 35 to 60 hours. The digesters were at first rotating digesters about 10 feet in diameter and 36 feet long. Later stationary digesters of about this size were made and stood on end.

The advantages of the Tilghman process with its higher steam pressure and temperature reaching 150°C. and thereby needing only the short time of 7 to 14 hours intrigued the industry and attempts were made to get better equipment for handling such a process. Some bronze digesters were used but when one blew up at Orono, Maine, it stopped the use of the bronze digesters.

The next step was to use a steel digester but put between the brick and the steel shell a layer of Portland cement. This was used for several decades and is still in use. Later there has been some digesters built with a carbon block lining instead of a clay brick lining. Now, we see coming into use the stainless steel unlined digester. It should be stated that Wheelwright about 1885 by

changing the form of the digester reduced repair costs from about $10 per ton of pulp to $1.50 per ton of pulp made.

Through all of this development it is to be noted that the several inventors kept improving and cheapening the process, partly by increasing the size of the unit from a digester holding 2 cords of wood to the present digester holding 30 cords of wood. However, through this period not a digester was built which was not under the license of one or more patents. Each new constructor wished to make a more up to date piece of equipment and carry out the process better and more cheaply than any of his predecessors. This has been accomplished and the bond paper on which you wrote letters today and which has as its basis sulfite pulp is a better paper than the rag paper used by your fathers. The cheapening of paper has meant a continual increase through the years in paper production. This increase of tonnage has run between 3 and 5% a year except for the years of 1921 and about 1933.

It is to be noted further that there has likewise been a continual increase in the aggregate of labor required. It is true that machinery has saved labor and that the large units require no more man-ours to operate than did the smaller units but it must be remembered that alongside of this there has been an increased requirement in hours of labor because of the desire for improved quality. There has been an increase in hours of labor because the wood is cut further from the mill. With this has gone an increased requirement of hours of labor in transportation. Furthermore, with the increased requirements for number of hours of labor has also gone increased wages per hour due to the higher skill required of workmen. The rate per hour of secondary employment such as that of truck drivers hauling pulpwood is higher than that of the railroad brakeman of railroad years, or of river logdrivers. Of late we have had the depreciated currency which still more increases the rate per hour drawn by the workman. In other words more men and a higher rate of pay per ton of paper pulp has been the order from year to year. Who says inventions reduce labor requirements. Inventions increase and not decrease labor needs—and for 72 years after the invention.

With all of this the public is getting paper cheaper than ever before. The primary reason for this fact is that the paper industry has been one which nurtured inventions and in which there has been no hesitancy to take a license under a new invention. The industry is, however, peculiar in one respect and that is that in general it pays a lump sum for a license instead of paying a royalty per pound of product made. If there had been no patents or if our patent system had been similar to that of European countries the paper industry would be in the same poor position as that of European countries which have a comparable supply of raw material, for example, France or the old Austria-Hungary.

Unpatented processes are, in general, not wanted in industry. A good chemical illustration of this was the process of making phthalic anhydride from naphthalene devised by Gibbs and patented by him as Patent No. 1, 285,-117. This patent was one taken out by Gibbs, an employee of the Department of Agriculture, and as such was dedicated to the public, so that anyone was free to use it without payment of royalty. The process was not only published in the form of a patent but also promoted and publicized by the Department of Agriculture and yet no industrial firms took up the process until the Gibbs English patent was sold to a British firm for, I understand, £5000. It was only when the process was further improved by other American inventors and the improvements covered by patents that American firms taking licenses under the improvement patents went into the business of making phthalic anhydride.

Industrial firms in general are not interested in taking up new unpatented processes. One of the first questions they ask regarding a new process is, if it is patented and if it is not they are not, and properly not, interested.

I have been asked as to how I view some of the patent questions that have been raised before Congress and Congressional Committees.

Time available does not permit discussion in detail of any of these questions. However, it is believed that the following represents the general opinion of the leading chemists and chemical engineers as well as most leaders of chemical industries and with these I concur.

We are in favor of:

(a) A single Court of Patent Appeals.

(b) Patent protection to date from date of filing, i. e., 20 years instead of the present average 3 plus 17 years.

(c) Decreasing the delays of interference.

(d) Abolition of renewal applications.

(e) One year public use period.

(f) One year period to assert invention priority.

We are opposed to:

(a) Publication of applications prior to final allowance and permission of "oppositions."

(b) Requirement of a standardized form for patent claims.

(c) Compulsory licensing.

(d) Annual taxes as in some countries in Europe.

(e) A working requirement as in some countries in Europe.

(f) Patent Office Actions to be answerable in less than the six months' time now required.

May I digress to discuss in some detail the most objectionable of this last group of proposals.

Compulsory licensing under the McFarlane and similar bills will handicap the individual inventor with unbearable costs of hearings and appeals and much time required for court procedure. There is no more reason why intellectual property, i. e., inventions, should be subject to compulsory licensing than for my automobile to be licensed to some taxicab driver to use without my consent.

There are many firms whose ethical standards are so low that I should object to haying any patent of mine licensed to them. That is, I should no more want to be associated with them than I should want to be associated with a gangster attorney of the type Mr. Dewey has been sending upstate. Scientific men, inventors, and business men are known by the company they keep just as much as men in other walks of life. Accordingly, we do not wish to have forced on us by government action association with men or firms of low type, as the McFarlane Bill would require.

This bill to provide for compulsory licensing also works against the individual and poorer inventor and works in favor of the large corporation for the large corporation can compel licensing at a low rate whereas now the individual inventor can arrange for an exclusive license at a rate which will reimburse him for the expense to which he has been put in developing the invention and also pay him some profit. Once the license has been forced by the proposed compulsory license law then the inventor is in no position to bargain for any further licenses.

The McFarlane type bill will also cause inventors and business houses to resort to secret process procedure in

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Highway Problems

By BRIGADIER GENERAL ROBERT S. BEIGHTLER

Director of Highways, State of Ohio

Address presented at annual convention of National Society of Professional Engineers.

Note: Brigadier General Beightler is honorary chairman of the Second Annual Ohio State Safety Conference on Public, Highway, Traffic, Home and Farm Safety, being held in Dayton, Sept. 17, 18 and 19.

During the past year I have gone into many sections of the state making talks and attempting to enlist public interest in the problem of highway safety. Someone has said: "The interests of the public are not interesting to the public."

Frankly, there is a decided apathy on the part of the public on this subject. This apathy must be overcome by presenting the case for traffic safety before the bar of public opinion as strongly as possible, and this I intend to do as long as I am Director of Highways.

In Ohio during the year 1938, 1922 persons were killed in traffic accidents, or approximately 5 per day. For each fatality there were about 35 injured and about 150 accidents involving property damage only. This means that in Ohio there were 67,270 persons injured and 288,300 accidents resulting in property damage only. The economic loss to the citizens of Ohio alone on the basis of an estimate made by the National Safety Council was approximately $85,000,000.

Nationally, the fatality toll from motor vehicle accidents skyrocketed from 10,723 in 1918 to 39,600 in 1937. In 1938, however, there was a decrease to 32,400 due to the national safety drives, and the 1939 figures will show a continuing down trend. When you realize that the 1937 figure is about equal to the total number of American soldiers killed during the World War you can grasp the significance of this problem. Unfortunately, unless the attention of the motorist is forcibly called to the matter, it is difficult for the average motorist to appreciate the seriousness of the traffic accident problem in this country and the toll we are forced to pay for the pleasure and advantage of individual transportation.

Mark Twain once said: "Everyone talks about the weather but nobody does anything about it." This safety problem we are trying to do something about.

First of all, let me say that there is no panacea, no cure-all, but we can effectively reduce traffic accidents by approaching the problem rationally and upon a factual basis. The essential factors in accident prevention are the Four E's: Engineering, Enforcement, Education and Enthusiasm.

I wish I had the time today to go into this most important phase of our work in more detail but I know that it is a subject which does not arouse as much interest as it should. But it has become somewhat of an obsession with me, and I am intensely interested in trying to improve conditions. We have organized what is called "The Ohio Traffic Safety Council," a non-partisan, non-paid group of 93 persons representing various groups interested in safety. Sub-committees are working earnestly to help us solve this problem and I know we are making progress. To make full realization of our success possible, however, requires action by the Legislature to tighten up our Driver's License Law, establish a Uniform Traffic Code, Ohio being one of only 9 states not having such a code, and a compulsory accident reporting law. With some of these legislative tools we will really be able to accomplish a great deal more.

But, I do feel that we have made real progress. Recognizing the obligation of the Department of Highways in taking a lead in this movement we recently created the Bureau of Traffic and Safety with Harry Neal as the Chief Engineer. There has been little augmentation of forces as we simply expanded the duties of the former traffic bureau and made the new organization comparable in status to our other principal bureaus. We are now, however, adding a traffic and safety engineer to each of our district planning offices who will coordinate all safety activities in the district, each of which comprises two divisions.

In addition to the creation of our safety bureau our Ohio Traffic Safety Council has made other progress in the interest of safety such as: Recommending that a course of study in traffic safety be taught in all public, private and parochial schools. Many schools have been contacted and manuals for this suggested training have been sent out with many satisfactory responses. The study has already been started in some schools and it is expected that many others will fall in line.

We are also at this time having surveys made by representatives of nationally prominent organizations of our Bureau of Motor Vehicles and the State Highway Patrol with the thought of securing the best possible advice on what might be done to insure greater safety on our highways. Out of these surveys should come some constructive recommendations, particularly in regard to drivers' licenses.

Our safety engineers and the safety council have also been working diligently for months with a legislative committee in regard to a new uniform traffic code and other legislation.

These are just a few of the many things being done by the department in the interest of safety.

Another problem which we faced early last year was the necessity of a sizable reduction in the large amount of federal aid funds which we had to our credit of approximately $16,400,000 the largest balance of any state in the Union by over $5,000,000.

A third serious problem confronting us in 1939 was what to do with the large secondary road mileage in Ohio. Savings were made in our purchasing methods, in the normal conduct of our maintenance operations and in our purchase of "hot mix," so-called, so we conceived a large state-wide WPA program of $15,700,000 later augmented to $21,000,000. We accomplished all this without interfering in any way with our regular construction program which amounted to over $18,000,000 one of, if not the largest in the history of the state.

We have a problem ahead for which I do not have the answer at the moment. Highways constitute a most important public utility today, a national utility owned and maintained by all motorists. Improved highways also pay dividends, but when there is needed highway legislation, it is difficult to arouse very much support of the persons who should be interested. We are actually still in our infancy in this work when it is realized that motor vehicle registration has increased from 8,000 in 1900 to nearly 30,000,000 today.

The building of our immense highway network has practically remade our economic system, which now depends on modern highways to such an extent that our communications system could not be much impaired without greatly disrupting, if not crushing, the entire structure.

The public has grown to depend on our highways and to expect as a matter of fact continued improvements and modernization to present day traffic demands. Actually, highways have probably had more to do with our industrial organization than any other factor. But our big trouble is that the public does not appreciate the seriousness of the highway problem of today.

Let us reminisce a little.

Engineers have been frequently criticized for their apparent shortsightedness in the design of highways some years ago, but at the time—I mean since the advent of the hard-surfaced road automobiles had comfortable cruising speeds of from 20 to 35 miles an hour, and Ohio, being one of the pioneer states in the construction of rigid pavement types, designed roads accordingly. Today we have approximately 2,000,000 vehicles registered in this state and the safe cruising speed has been increased to 50 or 65 miles an hour.

What does this mean? It means that a large part of Ohio's state highway system of over 18,000 miles should be rebuilt to modern standards and to meet anticipated traffic of the future. We have had a planning survey in operation for several years and we know today what to expect on each section of road in the state during the next decade.

We know that we must construct more multiple-lane highways with opposing traffic streams divided and more free ways in the areas adjacent to the larger centers or population—in fact, we are doing that today.

This is true not only because of normal necessity but also because of a new element which is being brought into the picture—that is, the modern methods of national defense consisting of mechanized and motorized equipment for warfare.

I am not one of those persons who believes that we necessarily have to build a large army for our protection. Nor do I think that we are likely to be engaged in a war in the immediate future, and most certainly not on foreign soil. But when the time comes to fight in our own country we should be prepared in the way of strategic highways to provide for rapid shifting of mechanized and motorized forces to any part of the country demanded by the immediate situation.

The most war-minded nation in the world, Germany, took cognizance of this some years ago and today her military highways are as much a part of her national defense as are her highly mechanized forces. By the construction of these strategic roads of four or more lanes that country is able to rapidly move military forces to any part of the country in a few hours and thereby offset the advantages any combined forces of superior numbers might have.

In this country our problem is much larger but just as vital. The United States is so great in area that there could be no good defense against a combination of nations attacking us on several fronts without an adequate highway net. Our army today, as you know, is being rapidly mechanized and motorized, and our natural defense would be to maintain comparatively small mobile forces that can be quickly moved to threatened points.

Generally speaking, the system of military highways follows existing roads on the federal highway system I know this for I prepared the strategic highway system for the War Department several years ago. I am simply bringing up this question of military roads because it emphasizes still more the necessity for modernizing our highways and because the necessity for these roads is being emphasized today as never before.

Roads have always had a great influence in military campaigns. The failure to date of the Russians in Finland has been due to lack of adequate communications—in other words, roads—with the severe weather as a contributing factor. During the Wilderness Campaign of the Civil War the supply system of Grant's army all but collapsed because of the poor roads. On the other hand, the successful conquests of Caesar in the Gallic Wars can be attributed to his vision in the building of roads, some of which have carried all kinds of traffic for 2,000 years.

Probably one of the best examples of the important part played by roads during a war is one you are undoubtedly familiar with. It is now known as the "Sacred Road" and runs from Bar-le-duc to Verdun. I have been over it myself. This road no doubt saved the war for the Allies for had Verdun fallen I shudder to think of what might have happened. Anyway, the Germans had destroyed every railroad, except one narrow gauge track and only one highway led to Verdun. This single road, which was carrying 12,000 troops and 2,000 tons of munitions daily, requiring 6,000 trucks, saved the day and possibly the war for the Allies.

The need of adequate highways for military operation will be increasingly greater now that our army is being mechanized and motorized. Horses in the army are practically a thing of the past and instead we have a highly mobile division today capable of marching 320 miles in 14 hours with its 1300 vehicles and approximately 13,000 men. As many will remember 12 miles constituted a normal days march during the war.

The requests of the army are most moderate. It agrees that roads constructed for commerce are generally identical with those required for military purposes. The Army has, however, prepared a network of specific highways connecting strategic areas with army depots and important mobilization and industrial centers; in other words, our principal centers of production with vital strategic areas. The standards of construction including surfacing, widths, bridges, grades, curvature, etc., generally conform to present day standards, or at least to our ultimate objectives. For instance, in Ohio, roads between Conneaut and Cleveland and Toledo and Chicago; from Cleveland to Columbus and Cincinnati; from Cleveland to Pittsburgh; from Cincinnati to Toledo by way of Dayton; from Cincinnati to Portsmouth and Ironton, thence to Charleston; the National Road, are considered most important from a military viewpoint.

But where are we going to get the funds to do all this multiple-lane construction on our most heavily travelled highways together with our other normal work? Let's review our situation. We have on our state system over 18,000 miles of roads, one of the largest state mileages in the U. S. The State gets approximately 34.5% of motor vehicles revenues collected even though the primary system alone of 12,000 miles carries 74% of all the traffic outside cities and towns. To cities is returned 45.2% of the revenues, counties and townships and over 20% goes to schools, enforcement, collection and hospitalization. With the exception of three other states, Ohio is the most generous state in the United States in returning motor vehicle funds to the smaller political subdivisions. Please don't misunderstand me, I'm not complaining for I feel

(Continued on page 26)

Progress

FROM: Professor Chas. F. Scott, Chairman, Committee on 1939 Progress Report, The Society for the Promotion of Engineering Education.

AS EVIDENCE of progress, the fifth annual Progress Report of the Society for the Promotion of Engineering Education, released prior to the annual meeting of the Society, in Berkeley, Calif., by Prof. C. F. Scott, as chairman of the Committee on 1939 Progress Report, continues the record of significant trends, developments, and events in engineering education which has had such profound influence on the present-day industrial development of the nation. The basis of the report is three-score letters from officers and chairmen of the Society; items indicating progress were selected, condensed, and epitomized.

Increase in enrolment is significant; undergraduate students in approximately 150 engineering schools in the United States and Canada today number about 106,000, an increase of nearly 30 per cent in three years. Candidates for the Master's degree number more than 4,700, and for the Doctor's degree 850, both more than doubled in three years. The report states that this "undergraduate increase is presumably due partly to the employment situation but mainly to the growing regard for engineering training as a preparation for careers in industry, business, and public service." Mechanical engineering enrolment, which shows the greatest increase during this period, 89 per cent, "may be traced to the character of this curriculum and to the recent publicity given to aeronautics, Diesel engines, and air-conditioning. Most mechanical engineering curricula stress management and labor problems, which may be an added explanation."

A notable trend in engineering education, indicates the report, has been in the field of chemical engineering, which is maturing rapidly, and becoming more and more a methematical, quantitative kind of engineering; its technical literature is growing; the quality of instruction and the physical facilities of the schools are improving; and a younger generation of teachers is putting it across.

After indicating the advances being made by engineering schools in the teaching of physics, English, aeronautics, surveying, geodesy, mathematics, hydraulics, and fluid mechanics, the committee calls attention to the subject of research. Quoting from a statement, it says that "prior to 1933 over half of new process and new product development came from Central Europe; in 1938, less than five per cent. Totalitarian influence on education is forcing American industry to a new dependence on research 'made in U. S. A.' The war in Europe may have an important influence here in the transplanting of refugee scholars".

The Society's Committee on Aims and Scope of Engineering Curricula in its contribution to the report presents the new conditions, trends, and attitudes which necessitates a new study of the subject, it specifies objectives and stresses the fact that the normal basic course should prepare engineers for a wide range of technical, administrative, and executive responsibilities. Some of the views it has considered include (a) the lengthening of the undergraduate curriculum to five or six years, (b) requirement of a period of preliminary study in a school of liberal arts preceding admission to the school of engineering, and (c) the trend in the direction of dividing the curriculum in the junior and senior stages.

The past year brought to completion the second stage in the accrediting program of the Committee on Engineering Schools of the Engineers' Council for Professional Development, of which S. P. E. E. is a member body. The first stage had to do with organizing the program of inspection and with developing principles and procedures. The second stage involved carrying these plans into operation. Consequently, there is available today an essentially complete list of accredited curricula of the engineering schools of the country for the guidance and use of state licensing boards for engineers, the national engineering societies, and the thousands of high school students contemplating an engineering career. A by-product of the investigations incident to accrediting is the interchange of information which has given opportunity for all schools, large as well as small, to improve their educational programs; a notable service which is appreciated and bringing results.

From *The Pittsburgh Engineer*

The Engineer in Public Business

By T. J. Mitchell

Engineers have not until recently disclosed an aptitude for public business and governmental matters. They have followed the habit of employees and devoted themselves to the interests of their individual employers. And with that lack of ability to cooperate with each other for which they have acquired an undesirable reputation, as evidenced by the multitude of their organizations as compared with those of other professions, they have only recently begun to employ their special talents in the public service.

It naturally follows from the engineer's custom of dealing with the unalterable laws of nature that he generally presents the facts as he finds them. It is, of course, not uncommon for the engineer in subordinate positions to color the facts to suit his employer's interest, but it is less common than in business or in other professions. It is the engineer's habit to be fair between client and contractor, between buyer and seller, between employer and employee, between capital and labor; and on account of this custom, born of his scientific methods and habits, he is better fitted than any other to bring capital and labor together on a sound basis and thus stop the enormous waste their quarrels now cost. Management is by no means free from the mind of the feudal lord; and labor is too generally dominated by leaders who make a living out of making trouble, out of endeavoring to secure for labor more than its just share of the goods it helps to produce and, for labor in his particular industry, more than its just share of the total earnings of labor in all industry. Out of ignorance or cupidity, labor leaders too often distort the facts, while management at times, by secrecy or deceit, secures too great a share for capital. The result is distrust, unfair demands, strikes, lockouts, and loss to both parties and to the public. The facts set forth impartially after the methods of the engineer would greatly reduce if not eliminate these bad practices.

It is not the purpose to argue that the engineer is the one logical man to perform all industrial functions, that he should entirely replace the lawyer as an adviser, that he should take over all the functions of the business man, that he should replace the financier, or that he should take over the functions of government, beyond the extent to which his place in industry and his peculiar fitness make wise; but it is imperative before we proceed much further that the engineer perform his proper part and office in all these matters.

Engineers in municipal government, which is chiefly engineering and business, are demonstrating their worth. They come to the work with unusual equipment: Technical knowledge, honesty of purpose, the creative mind; but the world is reluctant to admit that they have the business and the political qualities essential to the work. It is usual to thank fortune that engineers are not politicians, to deprecate the services of politicians because they are too commonly spent for the politician instead of the public; but though a politician is usually one who is in politics for private advantage, he may be one skilled in political science and administration; and if the engineer be equipped in this latter sense also, he should be an ideal municipal public servant.

In state and federal matters engineers have only recently ventured beyond their technical field. A whole administration of the Federal Government apparently subscribes to or at least acquiesces in the view that an engineer is not equipped to administer an engineering bureau or to conduct business affairs founded on engineering. It is true that this is politics of the questionable kind, but the lack of public confidence in the engineer's business and administrative ability makes possible its success. No one is disturbed about it but the engineer.

The United States developed in a century from an agricultural nation in which each household produced its own food and manufactured nearly all the goods necessary to satisfy its needs to a highly organized industrial nation producing goods of all kinds in quantity and at a price never before known, though wages in terms of money or goods or benefits are not equaled in any other country. The engineer has enabled the industries of this country to compete in the markets of the world with the handicraft nations with their vastly lower standards of living. We are too prone to congratulate ourselves on our progress, to be content as a whole people with the successes we have achieved, forgetting that in the warring of the groups or divisions of industry the individual, sometimes whole groups, frequently suffer; but there is always a material element of society which is too weak to hold its place; and in sacrificing it we are sacrificing the whole well-being of society. It is not a solution of the problem for the strong to halt long enough to give of their production to the weak: that is but a sop to man's sense of responsibility for his brother; the strong are obligated to help the weak to help themselves, to curb the predatory, and to bring to a higher level the lowest standards of living.

The engineer is a scientist trained in the application of the scientific method to all his problems, accustomed to determine and to be guided by the truth. It is his part to determine and present for the use and enlightenment of the public the whole truth about the industry he has created. When business, through greed or ignorance, abuses industry, a clear exposition of the facts is the surest means of setting the matter right. When self-seeking politicians attack industry for their own benefit but to the injury of the industry and the country, it is the obligation of the engineer, individually and through his organizations, to present the facts which will set the public mind straight. The energy to determine the truth and the courage to present it will go far toward curing the evil.

Are Engineers Selfish

World events bring increasingly to mind the fact that technical efficiency is largely the measure of national power; that national supremacy, actual or potential, is based upon engineering achievement. The great need is to bring the public to a full recognition of that fact. Whatsoever, therefore, engineers shall do to bring about that recognition, followed by appropriate action, it will be the antithesis of selfishness..

When will America and other democracies learn to put technical affairs into the hands of technical men? The answer is—when engineers themselves shall have succeeded in impressing their country with the value, the necessity of engineering supervision. The present situation is as if a mighty weapon were at hand, overlooked and unused, while the people bungle and muddle and flounder under the leadership of makers of catchwords and fine phrases.

The engineer, by the very nature of his profession, is not a servant; the engineer is a leader, a master, a creator whose forte it is to lead, to instruct, to originate, to preserve, to plan, and to build. To enchance understanding of that fact in a nation-wide scope is to strengthen and make secure the national existence.

Through the years that lie immediately ahead, it may well be that the very life of national integrity, yea, of civilization itself shall depend on the putting of responsibility on engineers, where it belongs. The engineer, himself, should insist that such be done.

ELBERT HUBBARD wrote: "Responsibilities gravitate to the man who can shoulder them; Power flows to the man who knows how." We are not so sure about that. Power flows not to the meek who hesitate to grasp it, and responsibility gravitates not at all; it is assumed often times by men wholly unfit to carry it successfully.

To sit meekly by, then, and watch a whole nation struggle under the denial of leadership of those most capable of it; apathetically and meekly to hesitate to use the power they have gained through superb training and experience to make the nation supreme and impregnable, is for the Engineers of America to shun a great responsibility. That is, indeed, the worst form of selfishness. It is something to answer for to posterity.

Earl Dwight Covell

M.S.M.E. Nominations

Nominations for 1941 officers of The American Society of Mechanical Engineers were announced recently by Prof. O. A. Leutweiler, chairman of the National Nominating Committee at the Semi-Annual Meeting of the Society in Milwaukee. Election will be held by letter ballot of the entire membership of 15,000, closing on Sept. 24, 1940.

The nominees as presented by the Committee are:

President, William A. Hanley, In Charge of Engineering, Eli Lilly & Company, Indianapolis, Indiana; Vice-Presidents, Dean Samuel B. Earle, School of Engineering, Clemson Agricultural College, Clemson, South Carolina; Frank H. Prouty, Partner, Prouty Bros. Engineering Co., Exchange Building, Denver, Colorado; Edwin B. Ricketts, Mechanical Engineer, Consolidated Edison Co. of New York, Inc., 4 Irving Place, New York, N. Y.; Managers, Prof. Huber O. Croft, Head of Mechanical Engineering Department, State University of Iowa, Iowa City, Iowa; Prof. Paul B. Eaton, Charge of Mechanical Engineering Department, Lafayette College, Easton, Pa.; George E. Hulse, Chief Engineer, Safety Car Heating & Lighting Co., New Haven, Conn.

SOME OPEN LETTERS

LA CONDAMINE, LE 5TH APRIL 1940
VILLA A LUJERNETA, TELEPHONE 025.41
(PRINCIPATUE DE MONACO)

MAURICE LEMAIRE
INGENIEUR CIVIL
(S. I. P.)

CARBONISATION DES BOIS
GAZOGENES ET FORCE MOTRICE
AU GAZ DES FORETS
USINES A GAZ DE BOIS

BATIMENTS INDUSTRIELS

CONSULTATIONS ET EXPERTISES

Mr. Samuel I. Sacks,
1821 N. 33d Street
Philadelphia,

(Etats-Unis d'Amerique)

Dear Sir:

I have your address through the French Society of Professional Engineers.

I take the liberty to call on you to know in which way I should be able to secure second-hand technical books or copies of technical magazines. I think you have second-hand booksellers in U. S. A.?

The principal items I am interested in are concerning town-gas, producer-gas and gas-producers, specially for low grade fuels, i.e., wood, charcoal and peat.

With anticipated thanks, I beg to remain,

Yours faithfully,

Maurice Lemaire

July 24, 1940

Editor,
New York Times,
New York, N. Y.

Sir:

I was very glad to read in your issue of Monday, July 22nd, on page 6, an article headed "Engineers Approve Defense Program". The article related to the action of a committee of the American Society of Mechanical Engineers, which issued a statement that the national program of defense production is in good hands; its initiation on a large scale is under way.

In this connection I would like to direct your attention to the recent cooperation of the national engineering societies in making a census of engineers for national defense. The Board of Directors of the National Society of Professional Engineers, of which I am President, on Saturday, May 18, 1940, unanimously adopted a resolution and transmitted to the President of the United States, the President of the Senate, and the Speaker of the House of Representatives, to the effect that: "The National Society of Professional Engineers in behalf of its member State Societies and Professional Engineers throughout the United State tenders its good offices and services, without qualification, in aid of National Defense."

I inclose herewith the June-July issue of THE AMERICAN ENGINEER, the official organ of the National Society of Professional Engineers, and ask that you look at the editorial on page 2. You will observe that ten national engineering societies have joined together in aiding the defense movement now under way.

I am writing to you so that you may be made aware, and through you the public at large, that the engineers of the country, almost as a body, have joined in this defense program. I wish further to call attention to the fact that all of the professional bodies are joined in overcoming any influence which subversive organizations, not professional in character, may have seemed to possess.

Very truly yours,

John C. Riedel, *President*
National Society of Professional Engineers

Think It Over

Although the registration of engineers is now carried on in forty-one states and is looked upon as a great forward step in the interest of our profession, it is not a cure-all for every problem that confronts us today. Registration has brought about an improvement in the standards of public health and public safety; it has brought about some restriction in the use of the term "Engineer," it has served to heighten somewhat the prestige of the qualified members of the profession. However, registration alone can do very little for the engineer along the lines of social and economic betterment. That can be accomplished only through a strong organization.

Much has been said concerning the professions of medicine and law as compared to that of engineering. There are several important differences that must be considered when making such

a comparison. In the first place, most engineers are not professional men in the sense that they operate individual offices and offer their services in private practice. About 90% of the engineers are employed as subordinates in large organizations. In the second place, engineers have not had an all-inclusive organization authorized to speak and to act for the entire profession in the same way that the medical and bar associations have functioned during these many years. In the third place, the very nature of engineering work is such that many engineers finish a project and move on before having had an opportunity to become established in the community. This is aside from the fact that his salary is such as not to permit him to cut much of a figure in the social life that is so important in the building of prestige.

Of course we, as engineers, cannot alter the nature of our profession. However, we can and have provided ourselves with an organization that will bring us together on a common front in the fight for improved social and economic conditions within our profession.

The National Society of Professional Engineers, founded in 1934, has been striving constantly to promote solidarity within the profession and to bring about lasting benefits for engineers. The Indiana Society of Professional Engineers, founded in 1937 ranks fourth among the twenty-three state societies making up the national body. At that, our state society takes in only about one-third of the registered engineers in Indiana. There is much room for improvement, and the greatest good can be accomplished only when every registered professional engineer in Indiana becomes affiliated with the society. (From the *Indiana Professional Engineer.*)

Committee Appointed

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
OFFICE OF THE PRESIDENT
1347 Municipal Building
New York, N. Y.

July 15, 1940

Engineers—
Walter L. Simpson, Chairman
P. O. Box 6, Ben Franklin Sta., Washington, D. C.
Robert Hall Craig
222 North Third Street, Harrisburg, Penna.
Henry J. Darcey
2036 N. W. 17th St., Oklahoma City, Okla.
William C. Kammerer,
1900 Euclid Ave., Cleveland, Ohio
C. George Kreuger
Dept. of Labor, Trenton, N. J.
J. E. Settle
Kanawha Banking and Trust Co., Charleston, W. Va.
D. B. Steinman
117 Liberty Street, New York, N. Y.
Donald H. Walker
428 Utility Bldg., Fort Wayne, Ind.
H. Comer Wolf
110 Main Street, Irvine, Ky.
Leland J. Wright
Court House, Mt. Vernon, Washington

Gentlemen:

It gives me great pleasure to appoint you as the Committee on Professional Relations of the National Society of Professional Engineers.

Cordially yours,
John C. Riedel, *President*

JCR:PHC

PENNSYLVANIA SOCIETY OF PROFESSIONAL ENGINEERS FIFTH ANNUAL MEETING, STATE SOCIETY

Hershey Community Building—Hershey, Pa.
(Time—Daylight Saving)

TENTATIVE PROGRAM

Friday, September 13, 1940

1:00 to 5:00 P. M.—Registration (Lobby).

2:00 P. M.—Committee Meetings (Chairman to notify their members and advise them of the subjects and action to be taken).

7:00 P. M.—Informal Get-together Dinner. (Main Dining Room, Community Building, Speakers).

8:30 P.M.—Executive Board Meeting. President Lohr presiding.

(During the day and evening, members and guests not attending the meetings have the choice of factory visitations, amusements of Hershey Park, swimming, golf, theater, etc.)

Saturday, September 14, 1940

9:00 to 10:00 A. M.—Registration for those not previously registered.

10:00 A. M.—Business meeting (Reports of Officers and Committees)—President Lohr presiding.

1:00 P.M.—Luncheon.

(Arrangements are being made for speakers—National President Riedel, and National Secretary Larson are being invited).

The Convention Committee—Engineers Irvin H. Geiger (Chairman), A. Bowman Snavely, George A. Rahn, Victor J. Snyder, Harry N. Herr, D. Paul Witmer—and the Attendance Commitee to consist of the Secretaries of all Chapters and any members they may appoint to assist them.

Committee on Qualifications for Registration

Digest of Report to be Presented at Annual Convention of the National Council of State Boards of Engineering Examiners October 28-31, 1940 at Charleston, S. C.

This committee is planning to submit a brief general correlating report and separate reports from its three Sub-committees. In the general report an attempt will be made to select and recommend the best methods available for deciding on qualifications for registration. Results thus far secured and suggestions for future work along the line of reporting in detail the procedures of a few good boards will be discussed.

The Sub-committee on Experience is making a special study of what constitutes qualifying experience in the

principal, separate major fields. Mechanical and electrical fields will be the ones primarily reported on this year. Such points as title, salary, degree of responsibility, rate of advancement, membership in technical organizations, and continuity of employment are being considered by the committees in the different fields.

The Sub-committee on Written Examinations states that its report will be "an attempt to deal with the subject of examinations in its broader and fuller aspect," basing its discussion largely on the very considerable amount of information collected by committees in previous years. Three fundamental questions will be considered:

1. To what does a certification of registration as professional engineer certify?
2. Upon what basis are these certifications now made?
3. What primary characteristics must written examinations embrace in order to accomplish the purpose intended?

It is the expectation that this Sub-committee will be able to select lists of questions as examples illustrating the third fundamental question. Member Boards are urged to respond to the Executive Secretary's requests for such lists, as only a few have been submitted to date.

The Sub-committee on Interviews and Oral Examinations will summarize and discuss information secured by a questionnaire submitted to Member Boards by the Executive Secretary. Since these questionnaires have been submitted to all Boards, the specific points, being covered, need not be reported in detail here, but they include such points as whether interviews and/or oral examinations are held; what purpose they serve; how they should be conducted; and whether exhibits are submitted during interviews. This Sub-committee plans to submit recommendations regarding the conduct and scope of interviews and oral examinations under separate headings, as they feel that interviews and oral examinations should be kept separate and distinct. The committee will interpret the purposes and results of interviews and oral examinations, the reasons why applicants fail, and prepare a general discussion which may be incorporated in the report of the Committee as a whole on what the fundamental objectives of a registration board are or should be.

(Reprinted from "The Registration Bulletin")

National Council of State Boards of Engineering Examiners

Twenty-first Annual Convention
Twentieth Anniversary
October 28-31, 1940
Charleston, South Carolina

Business sessions of the Council will be held on the mornings and afternoons of Tuesday, October 29th and Wednesday, October 30th. Reports of Committees will be presented, and other important matters will be considered.

Local Committee on Arrangements

Among those who will welcome you to South Carolina and look after your comfort are the following prominent engineers:

L. S. LeTellier, Chairman; L. A. Emerson, Vice-Chairman; F. R. Sweeny, F. H. McDonald, L. F. Harza, F. A. Dale, S. P. Darlington, B. M. Thompson, E. D. Jervey, John Anderson, J. E. Gibson, L. Y. Dawson, Jr., J. S. Williamson, John A. McPherson, R. L. Sumwalt, A. E. Johnson, S. B. Earle, E. L. Clarke, E H. Shuler, Harwood Beebe, George R. Morgan, H. L. Sligh, T. F. Ball, B. P. Rice and G. E. Shand.

The Engineer and Labor

Address presented by Dean E. A. Holbrook, Director of N. S. P. E., before engineers of the Aluminum Company of America

"Industry is a three-legged stool, whose legs are capital, management, and labor. Only when we can keep these legs of the same general length is the stool comfortable."

With these words, quoted from Andrew Carnegie, Dr. E. A. Holbrook, dean of the school of engineering and mines of the University of Pittsburgh, began his address to engineers of the Aluminum Company of America at the Hillcrest Country Club last night. He spoke on "The Engineer and Labor."

"In the past hundred years," he said, "we have, at times, seen the capital leg too long, and at times technical progress in the management leg made an uncomfortable seat for America. I am not so sure but that today we need to examine carefully the labor leg."

He then spoke on the manner in which research and technologic change affect labor, and the relationship existing between the progress accomplished by industrial research and the resulting changes in labor.

"Technological advance does not," he said, "throw people out of work except during the inevitable period of transition, and inventions; technologic application of labor-saving devices, and the development of new useful products have made us the first great nation to be comfortably fed, housed, and clothed.

"In 1870, 21 per cent of our workers were engaged in manufacturing as against 29 per cent in 1930. Agricultural workers decreased from 53 per cent to 21 per cent, but other occupations, mostly service, had increased from 24 per cent to 47 per cent. It is estimated that the 1940 census will show that two men engaged in manufacturing industry support three men in service occupations."

More than 200 guests attended the meeting, at which the third annual engineers' night was combined with the closing exercises of the engineering post-graduate classes held during the course of the year.

The engineers were welcomed by Ernest Jeffries, Aluminum Company engineer, chairman of the arrangement committee for the event, and the meeting was called to order after dinner by Thomas D. Jolly, chief engineer. S. K. Colby, Aluminum Company vice president, toastmaster, made a number of announcements concerning the post-graduate class organization for the coming year. The new education committee, he stated, is to be comprised of F. E. Muder, chairman, W. S. Rearick, R. E. Sheffer, B. C. McFadden and Dr. R. G. Sturm.

The post-graduate classes of the Aluminum Company have been given to company members for the past nine years. They began with special courses in mathematics, and during the past winter included such subjects as "Furnaces and Heat Flow," "Principles of Physics and Chemistry," "Metallography of Aluminum," and "Application of X-rays to Metallurgical Problems."

The instructors were Kirtland Marsh, Dr. R. G. Sturm, Dr. Wayne E. White, Fred Keller, and Dr. Dana W. Smith. In addition to the courses, company personnel attended lectures given by W. D. Keith on "Patents and the Engineer," and F. C. Pyne on "Aircraft Materials."

During the past year 145 employes of the Aluminum Company registered for the evening courses. Some of them, working for advanced degrees, received credit for these courses at the University of Pittsburgh.

How One Society Does It

To the Professional Engineers of Pennsylvania Who are not Members of the Pennsylvania Society of Professional Engineers

Dear Engineer:

As one Professional Engineer speaking to another, will you read this letter through to the end and then do some serious thinking about the subjects presented? The decisions you make, and the action you take will be of importance to your Country, your Profession, and your own future as an Engineer.

1. You realize, of course, that a very serious war is being fought overseas; that men, women, and children have been maimed and killed by the thousands. Imagine yourself in England at the present moment, or as having been in Belgium a few short weeks ago,—then consider this,—it is believed by many that these things could happen here. Against such a contingency we must prepare.

If, however, this Country is fortunately not touched by the war of shot and shell, we are certain to find ourselves engaged in an economic conflict with the totalitarian powers. In fact we are now actively engaged in Mexico and the South American Countries in a price cutting war, due to the influx of cheaply produced and generally inferior articles from European and Asiatic nations. Unless we can successfully combat these economic attacks, our own high standard of living—the highest in the world—will be materially lowered. This kind of war not only can happen here, but is actually in full swing, in its earlier stages, throughout the Western Hemisphere. It undoubtedly will be greatly intensified as soon as the conflict-at-arms is settled.

Whether for armed or economic defense, the Engineers of the State of Pennsylvania must, by united action, take a leading part in the development of our adequate preparedness program by preparing and mobilizing the members of the profession for any emergency which might arise.

The National Society of Professional Engineers, of which the Pennsylvania Society is a member, is, with other National Societies, cooperating with the National Committee on Construction Preparedness by furnishing lists of Engineers in private practice either as individuals or as members of firms.

The Pennsylvania Society of Professional Engineers, while aiding the National Society, is also working in close contact with the Executive Board of the United States Army Engineers in Washington, in preparation to provide qualified civilian Engineers, to aid the Army in its vast construction program. To do this job properly, we must have a record of the qualifications and experience of each Registered Professional Engineer in Pennsylvania. We urgently request you, therefore, to fill out properly the enclosed questionnaire and forward to this office by return mail. Please do not delay. The Architects sent out their questionnaires several weeks ago.

2. During the past everal years the Pennsylvania Society of Professional Engineers successfully defended your rights and privileges as a Professional Engineer several times in the courts of Pennsylvania. In these cases, your rights, as well as those of the Engineers directly involved in the cases, were in jeopardy. The decisions of the Courts in these cases is setting up a series of precedents firmly establishing the legal status of the Registered Professional Engineer. In the coming month of September we will be called upon again to defend our rights in the Dauphin County Court. In defending the rights of the Professional Engineer in the courts of the State the Society is performing a service for the Engineers which they as individuals would, generally, be unable to accomplish.

These court cases, because of attorney's fees, etc., have constituted a considerable drain upon the resources of the Society. In fact, had it not been for the generous support of the local Chapters and personal contributions of members of the Society, the work could not have been done. Because of the fact that this Society is defending the rights of the Professional Engineer, regardless of whether or not he be a member of our Society, we feel that you who are not members of the Society and have therefore not contributed in any way toward this activity, owe us, not only your good wishes, but in all fairness to your profession, your financial support.

We are, therefore, requesting your voluntary contribution of from one dollar ($1.00) to five dollars ($5.00), to enable the Pennsylvania Society of Professional Engineers to continue its legal work in behalf of the Professional Engineer. Your contribution will also permit the Society to become more active in the investigation of violations of the Registration Act, of which there are many, and help finance our defense questionnaires.

Please make check, or money orders, payable to "Pennsylvania Society of Professional Engineers." May we have your contribution before September 1, 1940?

3. Now just a few words about the Pennsylvania Society of Professional Engineers, which was founded in 1933, incorporated in 1934. Membership is restricted to Professional Engineers registered in Pennsylvania. At the present time we have not quite one thousand members belonging to nine local Chapters located at strategic points throughout the State.

The Society is not opposed to Unions, but is opposed to the unionization of the professions. In the past two years we have succeeded in promoting more amiable relations between the Engineers and the Architects, and have begun cooperation with the Legal and Medical Professions for the common good.

The Pennsylvania Society of Professional Engineers is a professional, not a technical, Society. While its objectives are many, its purpose in general is the promotion and protection of the Profession of Engineering, and the enhancement of the status of the individual Engineer, all in the interest of the public welfare.

Your cooperation and interest in our Society and the work it is doing will be greatly appreciated.

Sincerely yours,

RUSSELL S. CONRAD,
Acting Executive Secretary,
P. S. P. E.

The Responsibility of an Engineer to His Profession

Address by Engineer Sanford O. Schamberger, before the Albany County chapter, New York State Society of Professional Engineers.

"I hold every man a debtor to his profession; from which as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends to be a help and ornament thereunto."

FRANCIS BACON.

"Responsibility is like a string of which we can only see the middle. Both ends are out of sight."

The Engineer in industry is very often too literally "snowed under" in his work-a-day job to be able to look back at the years past and evaluate the responsibilities he has assumed, or to look forward to those responsibilities which are justly his to be borne in the years to come. In large part, I believe that we may be able to find the engineer's responsibility to his profession if we examine the engineer's responsibility to his employer, and because his employer is 30 chances to 1, an engineer also, we may learn of that responsibility by examining what it is that industry expects and requires of its engineers.

Of the man in this class, industry requires at least three things; first, knowledge in engineering science; second, skill in the technique of application; and third, judgment in the appraisement of values and costs. These three things are required by industry of the engineer and these three things are the responsibility of the engineer to his employer and to his profession.

The first two requirements are really only the means toward the end; the third is the fulfillment of the responsibility. Bound up very closely in this last requirement and inseparable from it are certain characteristics. The engineer must be of good mental and social habits with quick and intelligent responses. He must be reasonable and decisive, yet have the ability and tact to get along with other employes, and he should have the spirit and unselfishness to build the organization as well as try to establish his own position. The values inherent in developing attitudes of appreciation and understanding of the human factors in life experiences must not be overlooked or crowded out of the picture by him because it is in this phase of responsibility that professionalism becomes distinguishable from trade occupation.

Business corporations which engage the services of engineers have been dominated by a realization that a maximum of profit for the owners could result only from a broad dissemination of their products and this effects to a large degree, the socialization of the work of their engineers. We commonly speak of certain types of enterprises as public service corporations, the phrase denoting an obligation to serve. This is just one way of saying it is useful to the public, but all industry is useful to the public and so all business corporations in a broad sense are public service corporations and all engineers responsible to the public, and engineering is a socialized service. The appreciation of this socialized service as it affects the corporation is then the chief responsibility of the professional engineer and this appreciation can be obtained in only one way, by thought and rational control.

I was very forcefully impressed during the last week, as were probably many of you gentlemen, while perusing the January Issue of Fortune Magazine, by the pictures of various scenes from the plant of the International Business Machine Company, and the ever recurring sign which carried just one word, "THINK." That, I believe, is the essence of our responsibility as engineers. Our science, our society, our very beings are the result of countless years of experiment, of trial and error, and what worked has been retained and what failed, has been discarded. But this trial and error method must not be allowed to be just guess-work. It must be experimentation imaginatively conceived, rationally controlled and rigorously checked. *We must think.* We have learned from mathematics and science that in a complex system of any kind change must be made by increments and not by wholesale revolution. Our world today is indeed a complex system and change at any one point results in an incalculable change throughout the whole, so that changes, experiments, improvements, must be made slowly so as not to disrupt completely the hair-trigger balance which usually prevails.

We have witnessed for two decades, experiments with new social and economic orders, both at home and abroad, and we realize that these experiments must move forward by small steps, by increments, and not by revolution. The engineer has had experience with the only successful method of trial and error and I believe it is one of his responsibilities in his socialized service to think, to analyze, to weigh one scheme against another and to develop his creative imagination by rational practice, and thru his profession and society's acceptance of his profession, bring about a scientific trial and error for our social ills.

When the engineer in industry first finds that he must fight for self development, he is tempted to work only for himself rather than for his employer. He wants to be a brilliant performer and go places in a hurry with dreams of position and salary. If he follows this desire selfishly, he may one day awaken to the fact that too much zeal of this kind is holding him back and that he is really headed for one of those lone worker jobs which in most organizations, are blind alleys. In this condition, I believe the good football player has an advantage over the best scholar, for he has long ago learned team work. To go ahead on the main track the engineer must learn to put his organization first and adjust himself to the tempo of group activity. He must help others perform and not merely perform himself; he must judge men, fit them to their tasks, assuage their troubles, check their performance, reward their good works and inspire them with organization spirit. When, as and if the engineer has done all this for his employer and for industry, he has done it also for his profession and for himself.

Engineering Council—What of Its Future?

Announcement that the American Society of Civil Engineers will withdraw from American Engineering Council turns a spotlight on the failure of engineers to organize and maintain effective representation in the nation's capital. The idea back of Engineering Council was good, but early in its career its administrative officers tied it so tightly to the political kite of its first president, Herbert Hoover, as to ruin its effectiveness as a non-partisan agency. The council never fully overcame that handicap.

An added factor that seriously reduced the effectiveness of Engineering Council was the failure of the civil engineers to come in at the start and, in more recent years, their long dithering on the brink of withdrawal. Without doubt another weakening factor was the council's lack of interest in the professional groups such as the American Association of Engineers and the state societies that now make up the National Society of Professional Engineers.

All this is not to say that American Engineering Council has not done useful things in the 20 years of its life. It has, but the cost has been high, and most, if not all, could have been done equally well by one of the Founder Societies.

What of the future? Many engineers favor complete abandonment of American Engineering Council; others favor transfer of its functions to the National Society of Professional Engineers, which now represents 6,000 engineers in Washington. Out of the confusion nothing stands forth clearly except the fact that the interests of engineers in Washington are too diverse to be handled by a single agency if that agency is to attempt to develop policies and speak for engineers as a group, much as the council attempted to do.

But the answer does not appear to lie in complete abandonment of some central agency such as American Engineering Council. There still is need for a sort of listening post where legislation can be examined as it is dumped into the Congressional hopper so that matters of possible interest to engineers can be reported to the group most directly concerned. This agency would report on progress of legislation in Congress, would keep in touch with federal departments to learn what they are doing that might interest engineers and would be available to aid engineers in finding their way around the maze of federal bureaus. It would differ from A. E. C. in that it would not act as spokesman for any of the supporting organizations.

In theory, such a service could be rendered by the headquarters of the National Society of Professional Engineers; but as a practical matter that organization is so young and so lacking in national acceptance as to make that suggestion questionable. Also, as that organization aims to be a factor in national matters of interest to engineers it labors under some of the same handicaps that made A. E. C. ineffective.

American Engineering Council attempted to be eyes, ears and mouth for engineers in the nation's capital. It proved ineffective and even harmful as a mouthpiece. Before it is abandoned, it should be permitted to demonstrate what it can do in the way of keeping engineers informed as to what it sees and hears in Washington.

(Reprint from Engineering News Record)

Highway Problems

(Continued from page 19)

that a public official should take the funds provided and do the best possible job with them. But I do want to point out to you some pertinent facts peculiarly within the knowledge of the Department of Highways, and show you our problem.

As I said before, however, I frankly don't have the answer. Our gas and tag taxes are high enough now and I'm like the new mayor of Philadelphia—I don't know of any tax I like. Schools need the benefit of the liquid fuel tax unless funds are provided otherwise and with the general tax and relief situation in Ohio as it is, I see no immediate solution.

But it is something we should all think and ponder about for today we are making very little, if any, headway.

In fact, we are probably going backward when you realize that we can only build an average of perhaps 125 miles of modern highway per year on the primary system of 12,000 miles. Roads *will* wear out and some day unless a solution is found we may reach a crisis in Ohio. To modernize *our main state highways alone* would cost $550,000,000 or the equivalent of about 50 years of income based on our present yearly funds for construction.

There are a few recommendations I can make, however:

(1) Pass legislation to insure continuity of highway administration.

(2) Educate the public to a consciousness of the terrific cost of inadequate highways and show them we cannot stop highway deaths merely by legislation or law enforcement, but that we must build safety into highways.

(3) Show the public that we can't cure traffic congestion and its attending inconveniences, time loss and cost, by merely wishing to do it, and that we must build facilities to end congestion.

(4) Set up a sound highway program to insure safe and convenient use, and show what it will cost.

(5) Use all motor vehicle funds for highway purposes.

Chemical Engineering and Patents

(Continued from page 17)

order that there will be but a single firm manufacturing a product instead of a group of firms. This will mean a financial loss of patent fees to the United States Government and a loss to the public because there will be no disclosure to the public. There will be a similar loss to scientific and industrial advancement because there will be no record of work done and so time will be spent in repeating work previously carried out.

It is illuminating to note that the men who have urged items in this last group to which the chemical and engineering trained minds are opposed are almost exclusively men who have been in the business of spending other people's money, e. g., politicians and certain men of the legal profession.

Men who have had first hand experience with inventions and patents, e. g., inventors, scientific men, engineers, industrialists, patent attorneys, and the like are in general in full agreement with the opposition which I have just expressed.

Some have said that many of our economic ills are due to the patent monopolies. Rather the reverse is true. If we had not had these patents our economic ills would be much greater and we should be a much less prosperous country than we are now.

Report on Professional Ethics

(Continued from page 15)

Case IV

An employer is asked to recommend a man for a job. He has a competent man who would double his earnings by the shift. Shall the employer inconvenience himself by the loss of the man?

Case V

A professor or executive gets old, fussy and intolerant. He is intolerable as head of his department. Shall he be discharged or how disposed of?

Case VI

A contractor hired a gambler as a workman. His duty is to get the men's money so more men will be sober each Monday morning. Discuss policies in like situations. What are an employer's duties as guardian?

Case VII

A "Singing Coon" is a poor worker but is kept on a job to keep the men happy while busy. Discuss disutility as a measure of service by labor.

Case VIII

How bad a breach of ethics is it to accept a job with a company knowing that you are only waiting for a better job to come along?

Case IX

In reference to the adage "Business goes where it's invited and stays where it is well treated," is it wrong for a business man to entertain prospects without any attempt at bribery? Idea is O. K.; make a case.

Case X

Could an engineer be faced with the necessity of doing a small wrong to attain a greater good? A politician voted for a measure knowing it to be illegal and impossible as a trade for a vote favoring the University Budget. Idea is O. K.; make a case for study.

Some Phases of the Current Transportation Problem

(Continued from page 13)

from about $100 per year to more than $1900 per year for each and every vehicle. Again for obvious reasons it is not surprising to note that the tonnage carried by the highways is definitely on the increase and accounts for 5% of the total in 1937 or 2½ times more than it was twelve years before.

To continue our theatrical allusion for just a moment —it does not take an expert to see that something is radically wrong with the picture. The star is still in the center of the stage—perhaps not as young as her supporting cast but still in her prime and ready and willing to give a stellar performance. Why then do the other actors seem to be stealing the show? Youth may have a little to do with it and perhaps the spotlighting but I submit that there is more than suspicion of the "sugar-daddy" business. Old man taxpayer is being "taken for a ride."

I think that one of our leading economists has put the situation tritely when he says "If there were a charge that could be leveled at virtually a whole people with some degree of accuracy and fairness, it is the one to the effect that, to judge us by our political action in the field of economics, we are a nation of economic illiterates. When we need medical care, we usually go to men who are scientifically equipped to give us the needed attention. The engineer and physical scientist are respected even to the point of awe. But when it comes to political economy, the scholar who has acquired the lore of the science and stands ready to help us profit from experience and intelligence in that realm is the last one to whom we will listen. Instead, our people—leaders of business and public life as well as the led, turn from him to follow almost any quack who appears on the scene."

It is not my purpose to attempt a solution for our current transportation problem. The facts speak for themselves and if I have conveyed any of them to you in a way which will set you to thinking about the problem, I am well satisfied. I believe that just a reasonable amount of constructive thinking on the part of the citizens and taxpayers of the country will serve to show them what the answers should be and, once created, public sentiment will promptly dictate the necessary steps by Government to maintain a national transportation system now seriously threatened and so vital to our existence in peace or in war.

Let me conclude by saying that no sane railroad man has any quarrel with highways or waterways as transportation agencies. All that the railroads ask is a "square deal"—freedom to price their services so as to meet constantly changing industrial, agricultural and competitive conditions; freedom to consolidate along natural lines without the handicap of artificial rules or predetermined plans; equality in regulation, in taxation, and in subsidy—if subsidies there must be. In other words, not "special privileges" but only those privileges and opportunities accorded to the railroads' competitors.

The Power Situation

(Continued from page 7)

Fear is often expressed that, in emergency there will be a shortage of power. Such an emergency might be a sudden industrial boom or a declaration of war. In 1935 the Federal Power Commission reported a possible shortage of 4,000,000 K.V.A. Since then almost that full amount has been installed or is on order. Shortage in certain areas only, as was the case in the World War, is hardly possible now because of the greatly improved system of interconnections. Relief can now be had from great distances by passing blocks of power from area to area until the shortage is relieved.

Abundance of power is not wholly a responsibility of the power companies. A proper encouragement is due them from the government and from the public. A possible shortage can be relieved not only by greater production but also by economies in consumption. Far too commonly, the use of electrical energy is wasteful. In most industrial plants there is to be found some waste and inefficiency.

Manufacturing plants generally do not have, in their organizations, experts in power applications and it is not the particular concern of power producing companies or electrical machinery manufacturers to see that the power consumer is carrying on with the greatest electrical economies. Many consumers pay large electricity bills with no knowledge of the proper break-down of electrical costs within the plant. To such men the division of electrical energy in the plant is as mysterious as electricity itself. To them economies are a matter of luck rather than intelligent study. Their loads may come in peaks, motors may be much too large or too small, or of the wrong type, the processes may be wasteful of energy. Power studies in any plant are almost sure to uncover possibilities of conservation. It is in this phase of the power situation that much good can be done in emergencies.

To sum up very briefly, progress is being made to a very satisfying degree in power plant capacities and efficiencies, in transmission capacity, and in inter-connection of systems. This is true of the country in general and of Indiana in particular. Power companies are cooperating fully with the War Department in problems of wartime emergency. This planning is indirectly taking care of any extra peace time demands that may arise. In this field we have no need for worry. The situation is well in hand.

National Secretary Returns

Edward Larson, Executive Secretary of the National Society of Professional Engineers, recently returned to Washington, D. C. from a three weeks' "Good Will Tour," which he reports as very profitable to N. S. P. E.

One of the highlights of the trip was a meeting with the National Association of Power Engineers at Columbus, Ohio, on August 18th and 19th. Perry T. Ford, past president of N. S. P. E., and Secretary Larson addressed the conference.

Numerous contacts were made by Engineer Larson throughout Wisconsin, with a view toward the organization of a Society of Professional Engineers in that State. One of the most important of these was at Milwaukee, and another was at Madison, where he conferred with Daniel W. Mead, past president of the American Society of Civil Engineers.

While in Chicago, Secretary Larson met with the following:

W. Wayne Wallace, chairman of the committee on local arrangements for the sixth annual convention of N. S. P. E. to be held January 30 and 31 and February 1, 1941, at the Hotel Sherman.

Loran D. Gayton, President of the Illinois Society of Professional Engineers.

J. H. Morgan, National Director of the Illinois Society.

Mr. Larson also visited the national offices of the American Association of Engineers in Chicago—the group which edits the publication, *The Professional Engineer*.

In Minnesota, Secretary Larson attended the national convention of The Triangle Fraternity, of which he is a member; and also a meeting of officers and councilors of the Minnesota Association of Professional Engineers. At Fort Wayne, Indiana, he had a conference with Clyde W. Walb, chairman of the Indiana Legislative Committee.

Jobs

The United States Civil Service Commission announces open competitive, professional and sub-professional examinations for:

	Per Year
Chief Engineering Aid (Aeronautical)	$2,600
Principal Engineering Aid (Aeronautical)..	2,300
Senior Engineering Aid (Aeronautical) ...	2,000
Engineering Aid (Aeronautical)	1,800
Assistant Engineering Aid (Aeronautical ..	1,620
Chief Engineering Draftsman	2,600
Principal Engineering Draftsman	2,300
Senior Engineering Draftsman	2,000
Engineering Draftsman	1,800
Assistant Engineering Draftsman	1,620
Senior Inspector, Signal Corps Equipment..	3,200
Inspector, Signal Corps Equipment	2,600
Junior Inspector, Signal Corps Equipment..	2,000
Chief Statistical Draftsman	2,600
Principal Statistical Draftsman	2,300
Senior Statistical Draftsman	2,000
Statistical Draftsman	2,000
Statistical Draftsman	1,800
Assistant Statistical Draftsman	1,620
Principal Marine Engineer	5,600
Senior Marine Engineer	4,600
Inspector, Ordnance Material	2,300
Senior Inspector, Ordnance Material	2,600
Associate Inspector, Ordnance Material ..	2,000
Assistant Inspector, Ordnance Material ...	1,800
Junior Inspector, Ordnance Material	1,620

ANNOUNCING THE

Sixth Annual Convention

of

THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

to be held jointly with the

Fifty-sixth Annual Convention

of

THE ILLINOIS SOCIETY OF ENGINEERS

At the Hotel Sherman CHICAGO, ILLINOIS

January 30 and 31 and February 1, 1941

W. Wayne Wallace, 33 West Grand Avenue, Chicago, Illinois

is

Chairman of the Committee on Local Arrangements for the Illinois Society

A general outline of the convention program will be given in a succeeding issue of The American Engineer